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British Association annual conference 'Myth' of independence under attack

by David Walker
Social Sciences Correspondent

People in modern society were wrong to think that it was morally inferior to be dependent on others, Professor Ray Pahl, of Kent University, said yesterday in his presidential address to the sociology section of the British Association.

Professor Pahl, well known as a sociologist of cities and planning, called for a complete rethinking of the idea of dependence. He said that people had been brought up with a fear of being dependent on others, and the mass media built up a myth of independence despite the "oppressive psychological damage" this caused.

He gave the example of women fighting to throw off dependence. The full-time professional woman who got others to clean her house and look after her children was simply perpetuating the dependence of others, he said.

Self-esteem suffered in a society which encouraged people to believe that they were responsible for their social position when they were not. This was a psychological penalty of capitalism, Professor Pahl said.

Professor Pahl's address set the theme for other papers on dependence at work, in the family, in the welfare state and as a theme in political economy.

The theme was one of shifting values, Professor Pahl said. "The ambiguity and ambivalence which exists in Britain today, and the tension and difficulties which follow from these, suggests perhaps that we are experiencing a shift in the value system which we are floundering both muddling and confusing."

"A society with a very advanced level of production based on a high degree of technological complexity must create considerable dependence. The price of an independent society is a high level of dependence. Thus the more mobile the nuclear family, the more dependent on their jobs wage earners become, and the more elderly parents need social support."

Yesterday afternoon, some women sociologists took up the theme. Mrs Ann Marie Wolpe, lecturer in sociology at Middlesex Polytechnic, discussed the role of the curriculum in secondary schools inculcating into girls the limited possibilities of the female role.

"It is little wonder that girls

believe in the romantic notions of marriage, a home, husbands who will provide for them—and in return their undivided commitment to caring for their husbands and children. This belief goes hand in hand with an emotional and financial dependency," she said.

Taking her examples from interviews with children and teachers, and from the philosophy of major educational reports, Mrs Wolpe identified assumptions in the teaching of subjects like home economics, biology, woodwork and other sciences.

"The limitation of this type of approach in emphasizing one aspect of adult women's lives is based on the erroneous assumption that women's roles are confined to the home, and falls to take into account the working lives of women outside the home."

The dependent adult woman—as reflected by women's magazines—was treated by Miss Helen Roberts, tutor in sociology at Exeter University. She identified a picture of women that had changed little since the early twentieth century.

With examples from stories in *Woman*, Miss Roberts described what she called a "love ideology" in which women were rarely challenged the central place of husband, home, and children in their lives. Outside the home they were lost and divorce was exceptional.

"Although a neutral institution in itself, it is largely through the family, and in this case the interpretation by the media of the needs of the family, that women are kept in the position of socializing the labour force of the next generation, as well as servicing their work-weekly husbands."

To say that the image of women projected in magazine fiction is that of a woman playing the role most useful to the sort of society in which she lives is not to make any suggestion of a conspiracy theory, she said. One could scarcely suggest that the bureau of the press and publishing world combine to present the female reader with an image which will keep her in her traditional place and make her unwilling to accept, let alone seek, any changes in her traditional role.

Nevertheless, on the evidence of one of Oxford's own executives, "Women's weeklies consciously and deliberately refuse to advocate social change."

Grant for transport study

The Open University's energy research group has received a £4,320 grant from the Department of the Environment's transport and road research laboratory to study the resource implications of different systems of transport.

The grant, which is the group's sixth this year, brings the total funds received to more than £75,000. Six full-time research workers will be employed on the two-year project.

English at Ealing

English as a foreign language may now be studied at Ealing Technical College at degree level, linked with the study of another foreign language.

The new course, which is part of the college's applied linguistics programme, enables a non-English speaker to take a degree course in English as a foreign language and study one or two other languages, such as Spanish or Russian.

The course lasts four years, one of them abroad.

Sir Bernard on science and progress

by David Dickson

The simple belief that material progress flows automatically from the application of scientific discovery was a tragic myth of our age, Sir Bernard Lovell, this year's president of the British Association for the Advancement of Science, said in his address to the association's annual meeting on Wednesday.

"The vital question is whether the framework of society in which science is pursued can develop the ethical basis and moral purpose necessary to ensure that in our future progress we overcome the forces leading to decay and corruption," he said.

Speaking in Guildford Cathedral, Sir Bernard said that recent theoretical and observational developments in astronomy had caused him to alter his previous conviction that science was neutral in its impact. He now realized that its deepest pursuits were inextricably entwined with human purpose and existence.

"It is of great significance that we should attempt to discover why the deeper ambitions for the understanding of human purpose no longer exert such a dominating influence on our lives as they did for our forefathers."

"The Puritans sought for understanding by running from one bourgeois sermon to another. But for our generation, science, coupled with technology, became the God through which we would find the road to economic and intellectual salvation."

Sir Bernard said that the argument on whether the universe is—and always has been—in a state of continuous creation had been clarified. But it had left an imponderable conceptual difficulty.

It now appeared that the universe had evolved 10,000 million years ago from a dense concentration of primeval matter. "Today it is simply possible to observe the radiation left over from the initial high-temperature phase of the universe, which lasted for perhaps the first second or so of its initial expansion, and in which period the temperature dropped from a million million to 3,000 million degrees."

"The great difficulty of evolutionary theories of the universe which were based on Einstein's theory of general relativity was that they predicted a singular condition of infinite density of infinitesimal dimensions before the beginning of the expansion."

"It is an embarrassing situation for science. The great achievements of observational astronomy and those of theoretical physics have led separately to the same concept, but the initial state of the universe, like one of infinite density," Sir Bernard said.

"The transference from this infinities of density and size and time to the finite quantities anomalous by the laws of the physical world may lie beyond scientific comprehension," he said.

This raised the question of whether man faced such difficulties because he externalized the object of his investigation. Today it was impossible to evade the problems of our existence by escaping into philosophical idealism.

"On the contrary we are forced to recognize that although in our daily lives we are surrounded by progress, there is a profound and independent investigation of the nature of our existence which is not possible when we search for answers in the depths of the natural world."

Sir Bernard said that the apparent existence of a remarkable and intimate relationship between man, his fundamental constants of nature, and the initial moments of space and time, seemed to be an inescapable condition of his audience's presence in Guildford Cathedral.

"The pursuit of scientific understanding of observable phenomena is an essential occupation of modern society. But I cannot believe that this quest embraces the totality of human purpose," he said.

"Human existence is itself entwined with the primeval state of the universe, and the pursuit of



Barbed wire is fixed across the entrances at St Michael's Church, Welton, Buckinghamshire. It is the village church for a "village" which no longer exists, for Welton now contains fewer than half a dozen houses, and its 70-acre campus of the Open University at Walton Hall, near the new town of Milton Keynes.

St Michael's and its churchyard are now part of the OU site, but the church itself is rapidly becoming a ruin. Part of the roof has collapsed, the entrances are blocked, and the churchyard is overgrown.

But the church is not alone. English Gothic-style churches, like the older and more beautiful buildings on the OU campus, could be getting a new lease of life.

Members of the university's Christian Forum hope to raise funds for the restoration of the church. Occasional services are already held there, and St Michael's has become again a focal point for religious and community life.

Historically the boards were established to guarantee some kind of uniformity in entrance standards. The Joint Matriculation Board, for example, was originally formed in 1903 by Manchester, Liverpool and Leeds Universities "for the regulation and conduct of matriculation examinations, including the conditions of exemption therefrom."

As at London and Cambridge, the board's work expanded in the 1950s with the introduction of the GCE. *Matura studentia*, one board secretary said, present moves towards a wider 16-plus examination under agreement this year to with voluntarily advertisements on day the joint advertisement appeared, and then only to advertise new courses or courses appearing in the joint one.

Many polytechnics seem to be following this advice, although the advertising lists of courses in *The Sunday Times* and *The Guardian* say that the advertising of appointments and new courses was down from last year, and that less than half of the 30 polytechnics have bought individual advertisements. With advertising costs at £16 per cent, *The Sunday Times* and £7.50 in *The Guardian*, polytechnics and colleges are careful how they spend their money. A recent three-column advertisement of 18cm for the North East London Polytechnic in *The Sunday Times* cost £864.

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David Walker looks at the schools' examination boards

Bulwarks in the defence of standards

The roll call of the universities' examining boards—Oxford, London, Oxford and Cambridge, Joint Matriculation, Southern, London, Cambridge Local—sounds like the traditional guarantee of public standards in examinations impartially handled.

But that image belies their wider role in the educational system. Boards like Cambridge and London are large enterprises run by energetic secretaries and the willing efforts of thousands of teachers. The university connexion is limited and the boards have for some years been caught up in educational innovation, confident that in the taught politics of Schools Council, teachers' unions and examination standards, their voice gets heard.

On paper the boards are among the few institutions left where schools and universities meet formally. Teachers and lecturers share the burden of a level marking and the boards' subject panels act as a channel for curriculum ideas to flow from classroom to university department and vice versa.

Though much of their work is at O level of the General Certificate of Education—and outside GCE in English as a foreign language, higher school certificates, and recently, at Cambridge, in cooperation with the BBC on language courses—these boards remain on paper the keepers of the universities' walls. They are guardians in the last resort of standards of entry for the majority of candidates, who in London and Cambridge certificates prize possessions, not least in the former colonies.

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heavier state control were like a revolution in the school certificate that existed before the GCE. Cambridge Local was founded in 1858 and, paradoxically, though the board has expanded and flourished, particularly overseas, Cambridge remains one university which accepts a large number of students on the basis of its own college examinations alone.

Formally, the University of London owns its board, lock, stock and rather undisturbed frontage on Gower Street. The constitutional position of the Cambridge board is similar. Rather to the envy of Mr A. R. Stephenson, secretary to the London entrance and school examinations council—the board's full title—Cambridge occupies a new purpose-built set of offices near Fensway's cricket ground.

Space is at a premium in the hectic days of June and July when the scripts come back for checking and remarking and the board spills out into a nearby school.

Both boards put much emphasis on the involvement of practising teachers at every stage of examining—drawing new syllabuses, introducing different methods of assessment and testing new examinations. But the actual degree of teacher representation has aroused some argument. The National Union of Teachers, which is a powerful interest group in the Schools Council, is in favour of the full teacher control of examinations.

A former secretary of what is thought of as a more conservative board—Oxford and Cambridge—perhaps had the NUT in mind when he said a couple of years ago: "There are some who are indifferent to the survival of the GCE boards."

"Universities will be more nearly affected by the fate of the boards than they realize. Regionalization of examining at 16 plus could assist the prospect of regionalization at university level, so dear to the state of some reformers. And if bigger sixth forms need not mean worse as far as examinations are concerned, the proposed system of unified examinations at 16 plus will at least create more difficulties for universities than the Schools Council."

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Both Mr Stephenson and Dr Frank Wink, secretary of the Cambridge Local Examinations Syndicate, plan to direct conflict between the board and teachers.

They also play down suggestions of tension between the GCE boards and the Certificate of Secondary Education boards, which are favoured bodies in some teachers' sectional schemes.

Dr Wild spoke warmly of Cambridge's cooperation with the East Midlands, East Anglia and South Western CSE boards. The three Oxford and Cambridge GCE boards have advanced plans for handling the proposed new certificate of extended education, having been approached by schools anxious to have the tried and trusted weight of the board behind the new examination.

At Cambridge, teachers form a majority on the school examinations committee which basically determines what is done. Under it are subject panels mostly comprising teachers, but also some university representatives. At this level it is possible for lecturers to convey to teachers some idea of where the frontiers of a subject are, and the direction in which a subject is heading.

The rest of the board's work is in the hands of teachers who give up chunks of their summer to mark scripts and check their marks with their colleagues. It is a large-scale business. Last year nearly 23,000 candidates sat Cambridge A level in Britain. Nearly 200,000 pupils sat London examinations in Britain in June 1974. Pupils' is not entirely accurate for 20,500 of these were aged 19 or over.

The boards are custodians of standards. Mr Stephenson said: "Our job is to make sure standards do not change over the years so this year's marks are thoroughly compared with those given last year. No research has been done since there has been a fall, but it is not easy to compare like with like."

"Take biology syllabuses. The DNA genetic code was not known to any day at university yet it is in the syllabus now. We can never get

more than a few steps in advance of the teachers and can never tell them how to teach: we had an A-level syllabus in mathematics that took two years to prepare, but it was out far in advance and was widely criticised by teachers."

To meet that, Mr Stephenson added, the board held regular conferences not only of the markers and examiners but of teachers in general. The flow of information between those who set syllabuses and those who taught them was a high priority.

Both Cambridge and London have made much of the running in training examiners and all those concerned with examinations, both home and in developing countries.

The impression given at Cambridge is that examiners will bend over backward to try to avoid the freak result—the pupil who shines in all his teachers' eyes and who if the public trusts the results, Mr Wild said, there were limits to the checking process, reluctant though he would be in any individual case to forswear on somebody's result.

He said: "But if you want comparability and reliability some restriction must be placed on individual variation." A similar limit must come on the summit of variation schools can be allowed under the new "Made three" examinations which they effectively set and mark examinations themselves. Mr Wild spoke of the need for reconciling the schools' initiative with the principle of public comparability of results.

Public trust in the competence of the examining boards' work. Mr Wild said a successful examination depended on public confidence. If the public trusts the results, so must the universities when October and their new intake comes. Mr Wild said the boards were not committed to saying that a level had to be kept as the test; but the interests of the users, parents, employers and universities had to be remembered.

"What the university requires is some ability to select, to ensure candidates have the body of knowledge to deal with the courses. University courses must not be altered to finish at a lower level than at present."

There are no victims—except perhaps the road casualties—sacrificed in the sun to appear in anger. Only bodies prostrated voluntarily on the sand to absorb its supposedly beautifying and health-giving rays.

Like most religions, however, this new cult of the sun is based upon an illusion. Long exposure to its rays can produce only cancer of the skin, not the eternal bronze youth which its worshippers so obviously desire.

There is nevertheless an ideal vision of the Mediterranean which not even the driving habits of the French can entirely obliterate. It is the land of the olive, the cypress and the vine, of families strolling together through the streets in the cool of the evening, of *petanque* played in dusty squares in the shade of the lime trees, of long afternoons, rapid ducks and limoncello, stilly skies.

But the road manners of the French do put paid to one myth: that they are better in bed than other nations. If they really enjoyed the nightly ecstasies which legend attributes to them, they would never cling so aggressively to their right of way, or blast their horns so violently at the timid Anglo-Saxon who dares to drive slowly.

Let me be a lousy lover. Their accident statistics confirm it. The death rate in France is three times what it is in America.

Philip Thody

Le camping: bold bodies at Squalor- sur-Mer

It's not the decline and fall of the Roman Empire that I most deplore, but the decline and disappearance of Roman plumbing. Here, within 50 miles of the Pont du Gard, there apparently eternal triumph of Roman technology, there must be more blocked loos than in the whole of North America.

But perhaps the Camping/Carevaning of Lo Bergerie, Roquebrune-sur-Argens, is not the best place from which to speculate on how geographical areas, like animals and human beings, cannot inherit acquired characteristics. A camping site in the South of France corresponds perfectly to Galbraith's description of American capitalism: private affluence and public squalor.

This £3,000 caravan, the portable television sets, the electric razors, the motorized barbecues and self-defrosting refrigerators make the camping site a high-tech area of uncollected barbarism, the unworkable showers and the unspeakable lavatories even more glaring a witness to what happens when human beings regard the city in which they live as a mere adjunct to this property that they own.

It is thus a convert, if only temporarily, to the high-tech and electronic civilization of the modern welfare state. Man is not only the cleverest, sexiest, most talkative and most violent of all animals. He is also, except perhaps for the dog, the dirtiest. He must therefore be protected, if necessary by force, against himself.

The camp-site manager, to whom I carried my complaints, voiced the essential pessimism which has been the traditional justification for all authoritarian regimes: "Le client, c'est-à-dire le monsieur, il s'en fiche." He must then be made to care. And as our modern legislators have discovered, to pay.

In the nineteenth century, that classic period of the don, they took vocation. "Holidays" as a survey representative once opined, "are for the people who work in Mr Morris's motor-car factory."

Vacations were spent, away from Oxbridge, on heavily and strenuously moral occupations: climbing the Alps, cycling in the Black Forest, exploring the castles and cathedrals of Europe on foot.

In the nineteenth century, of course, nobody would have come on holiday in the South of France anyway. What John Weighman calls the "solar revolution" had not yet taken place, and the Riviera was exclusively a winter resort. Then, as if by accident, the institution of paid holidays coincided with what is surely more than just a revival of the ancient religion of sun worship.

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STUDENTS!

The Times has been published continuously since 1785 and is unrivalled as a prime historical source: there is an index for all periods from 1790 till 1973, with volumes for 1974 expected from the printer soon.

Almost all local authority and University Libraries hold the Times Index and most keep The Times, either as bound volumes or in the microfilm edition. So, if your summer studies could benefit from using The Times, contact your local librarian.

In cases of difficulty please write to us for information on the nearest library holding issues of the period you require.

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16 Westcote Road, Reading RG3 2DF, England.

Crisp research in the bag

The Plant Breeding Institute may play a part in producing more beautiful potato crisps. Researchers have discovered that a bright, uniform, straw-coloured crisp can be made from a potato cross developed at the Institute. Now five hundred-weights of the special potato have been sent to two crisp manufacturers for commercial assessment.

In the annual report for 1974

Amario, Canada and Italy are now growing plants.

In its laboratories, a special strain of Italian russet, also known as the Russeto in Cambridge, is now in use in France.

Discussions have taken place between the Institute, potato processors in the home and more home growers who are more home growers in particular.

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The Open University takes its advice and equipment overseas. Frances Gibb reports

'You cannot remain isolated'

The Open University is fast becoming one of Britain's main exports. Now securely established in Britain, it is spreading its tentacles abroad, and its expertise in soft and hard-ware is increasingly in demand in countries ranging from the United States to Pakistan and from Israel to Nigeria.

Expertise is being devalued in two forms. First, in the form of advice on distant learning systems which can be applied not only to undergraduate education but also to secondary schooling or vocational training. Second, in the form of the course materials themselves: books, cassettes and films.

The second is part of the OU's remit, since it has an obligation to the Department of Education and Science to try to obtain income from foreign markets, in order to lessen the university's burden on the taxpayer. Offering advice, however, is undertaken as a non-profit-making activity, and it is not officially part of the OU's work. Yet as the market flourishes, its need is increasing.

The turnover from marketing materials has grown from £92,924 in 1971 to £481,000 last year. The surplus on last year's turnover was, however, only £16,000, due largely to the local difficulties caused by local government reorganization and the economic climate. This year it is expected to improve.

Exports now account for about 65 per cent of the total turnover. OU materials are selling all over the world with Australia as one of the best markets, followed by Holland, Germany, and Scandinavia. As well as America, the OU has agents in the United States, South East Asia, Africa, and there have even been agents in Eastern Europe and the Soviet Union.

Although sales have been high in Iran, the potential of other oil-producing countries has not yet been fully developed. An OU agent will be going out to Saudi Arabia for the first time in the autumn.

The OU markets 16mm films of its joint OU/BBC television production, and more than half of the overseas sales are from these. In Britain, however, the bulk of the turnover is on books. Films are usually hired rather than bought, and cassettes, although selling well—particularly to college libraries—make little profit.

One area within the overseas market which has a vast potential is that of translations. Already books are published in Spanish, Italian, Dutch, and Danish and it is hoped that more languages will soon be included.

Mr John Cox, sales manager at the OU, says that the Spanish language market, where 56 OU titles have now been translated, is one of the most exciting. "The interesting thing about this market is the huge number of students in Latin American universities," he says. "For instance, in Mexico City, where the population is about 8m, there are three major higher education institutions, with a total of about 450,000 students. This is in one city, in one country, and it is repeated throughout South America."

Apart from providing money for OU, what other advantages does this marketing have? "Selling material on a commercial basis is an efficient way of distributing our material," Mr Cox says. "Due to us, it is being sold in a way that it can be used by a large number of people."

The results of the Cambridge Joint Examination, the entrance examination run by the colleges, are also interesting. Although the state and other schools prepared 1,894 students for these examinations, and the public schools 1,260 students, more than twice as many public school pupils were unconditionally accepted. About 240 state school pupils were accepted unconditionally this year, against 497 pupils from public schools in the results of the joint examination.

For women the position is different. Almost all women have to take the college examinations to qualify for entry and this year none have been accepted unconditionally. A level results. Far more women candidates in the college examination came from the state schools than the direct grant and independent schools, by a ratio of about two to one.

The least popular faculties for men according to the number of applications per available place this year are classics and mathematics.

2.3m OU course books are being used in different parts of the world, and the fact that they sell well is due to our academics. So there is this spin-off—that our reputation is enhanced by making the material readily available.

Marketing is firmly established, but it has brought problems and it was marketing that led to the establishment of the Open University Consultancy Service, the other arm of the OU's exports.

The OUCS has sprung from the need to answer academic problems arising from sales in the United States but, although marketing and consultancy remain separate, it is the profits from marketing that enable the OUCS to operate in all the countries where the OU has agents.

It was clear that the United States could be used in the United States, says Professor Michael Neil, director of the OUCS and professor of educational technology at the OU. "So here was a practicable marketing proposition: OU materials could be bought for a fraction of the production costs, which is between £350,000 and £600,000 for one full length course. There was also United States expertise which we could buy at a fraction of production costs, so it would work both ways."

Research at three American universities proved that the use of OU materials was quite successful, but the marketing agencies could not cope with the large number of academic questions arising. The North American OUCS was set up under Dr Barry Shorthouse, formerly a regional staff tutor. Its functions range from the simplest public relations work between universities and the provision of a ready point of reference for inquiries to negotiations over the production of independent learning materials which would combine United States capital with OU expertise.

The OUCS main office at Milton Keynes was established on an experimental basis nine months ago. Professor Neil says they have an international responsibility to respond to the demand for advice on distant teaching systems. "You can't remain in isolation. You have to respond to the best of your ability," he says. But like the American office it operates on a shoestring budget, with a minimal staff and no external grant. Whether it will stay after 1977 will depend on whether it is doing a demonstrably useful job for the OU—and is paying for itself.

Its services are offered to governments, agencies, or individual institutions which are considering new learning systems. Advice might be on the management of such systems, on the design of materials or on how to distribute them. The time involved may range from a day spent with an OU representative to a project lasting several months and carried out by teams working in close co-operation with the client. The country concerned or Britain may be. Economic fees have to be charged for the services because of the lack of other sources of finance but the scale is flexible.

Sometimes educational development is linked with a rural development programme such as in the OUCS project in Pakistan, the People's University, which is tied in with a village network scheme which will gradually cover the whole of Pakistan and embrace roads, welfare, housing as well as education.

I was inspired by the OU and a feasibility study carried out by the OUCS recommended that the British Council set up a "comprehensive scheme of collaboration" between the People's University and the OU over the next two years. So far, however, not much has been undertaken because of limited funds.

Much of the OUCS work is in collaboration with the British Council. For instance, the feasibility study on the People's University was undertaken at the Council's request. At present, the OUCS is negotiating to become a member institution of the Paid Educational Services unit, because, as Professor Neil says, "We are necessarily one of the main assets this country has."

PES involvement does provide a problem for the OUCS. Income from PES countries provides one way of helping OUCS work, but it is not for the lack of cooperation on the part of British Rail in continually raising their charges, the day return to London would be a "good buy" for university staff.

After a day at a seaside meeting, whose interludes were filled with exchanges of horror stories of gloom and doom, at the home university of the participants, I fell to wondering whether this is a uniquely difficult time to be in a university or whether my tutors and professors of nearly 20 years ago, in spite of the brave faces they invariably turned towards their students, had similarly depressed private conversations.

Attempting to recover some objectivity, I recognize that the whole thing must be cyclical, but even on an objective plane, I have serious fears that the amplitude of the oscillation, tied in some complex way to the economic fluctuations, is increasing while the period is decreasing, and as a well-trained applied mathematician I look anxiously for the "non-linear effect" that will inevitably modify the process.

The basic characteristic of a non-linear process is, of course, that a small change in some cause or input produces a quite disproportionate large change in effect or output. The difficulty lies in spotting which small change in input will be critical, and in what way.

That the influences comprising the critical inputs had not been spotted by the planners of yesterday was made clear to me when, clearing out, later in the week, some of the accumulated papers of the OU, I found a note of a meeting for more than 20 years or so, either in the university or at home.

I chanced to notice in the outgoing rubbish a draft of a submission to the University Grants Committee for the quinquennial 1972-1977, dated June, 1971. One of its pages and reading its phrases, I

If they do not get the money, Professor Neil says, two ways of keeping OUCS forming a research and development department within the OU, and whose staff would also be available for consultancy work, to establish the consultancy service as a separate company. But he fears that the most likely outcome will be that the OUCS would be disbanded completely. "We're not doing this for the sake of a few pounds," he says. "We're doing it because we can give specific advice, and which is in high demand."

Don's diary

Cyclical depression

Reading some recent diaries, I was initially surprised at the number of contributors who allegedly write from the interior of an aeroplane bound for exotic destinations. I found myself beginning to write in the rather less excitingly bound but perhaps similarly cocoon-like environment of a train bound from Kings Cross to Leeds.

It seems, unfortunately, that periods of two or three hours totally free from distraction are increasingly hard to come by and, were it not for the lack of cooperation on the part of British Rail in continually raising their charges, the day return to London would be a "good buy" for university staff.

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I realized that here was a remarkable find indeed, and one which perhaps should be required reading for the present generation of planners for the next millennium.

It amazes me to rediscover the way in which we (because I was certainly a party to it, notes and alterations in my own unmistakably illegible writing are all there) just four short years ago, anticipated a major increase in high single subject and combined studies students. In a department whose intake has since halved, or "expected a considerable expansion of applications," or "expected a rapid expansion in student numbers," or "will double the number of students." In departments which have faded only slightly better.

Certainly an expectation of a roughly linear response to applied policies led us in that document to forecast a continued growth more or less in line with the past five years or so, but clearly influences beyond our comprehension were already at work which, within two years, had rendered our plans (at least in the science area) totally unreal.

Working men

Incidentally, I remember reading recently in the paper that the number of British men going up to university actually fell by 7 per cent between 1972 and 1973. It is interesting to find this supporting evidence to my discovery some months ago, surprising both to me and to many others I seemed, not the number of British men entering Leeds University as undergraduates was actually smaller in 1974 than in 1968, despite the large overall expansion over that period, which apparently came from women and foreign students.

Surely there is a fertile field for some sociological study here—were we not assured in the late 1960s of the tendency for a larger and larger proportion of the relevant age group to come to university? Perhaps there is a growing trend for British men to spend a year or two away from full time education between school and university. Such a trend would, of course, reduce the intake for a few years and subsequently cause a minor rapid increase.

Unfortunately I don't see any evidence of such a trend. I say unfortunately because, in my experience of perhaps a dozen such "mature" students, my smug impression has been that they both

gained from and contributed to university in a way straight up from school. Their motivation was clearer and their ability to organize their life efficiently was greater, though this is doubtless to be expected of a man or woman who chooses to come to university after a period in a job; after a year or two of reasonable income it takes a certain amount of courage to revert to student grant standards.

Exercise in futility?

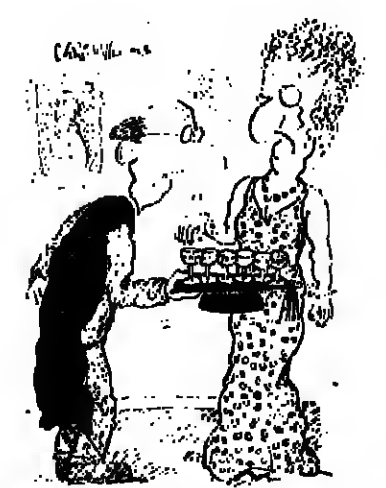
Unhappily it seems to me that the critical influences mentioned earlier have still to be positively identified. What is it that without warning causes the number of applications to a major department with a record of many years of success and good public relations to fall by a third in a single year? Is it the perception of a crisis in the department, or a crisis in the university, or a crisis in the country, or a crisis in the world? It is a candidate to accept rather than decline an offer, to make one not a first-choice rather than another, or even to apply to a number of universities at all?

In the absence of answers to these and many similar questions the planning for specific numbers six or more years ahead seems nothing more than an exercise in futility, on exercise which, by chance, we went through in senate in great length only a week or two ago.

What then are we to do? Clearly the primary requirement is a plan flexible enough to embody the ability to cope with substantial variations in the balance of student numbers between the several faculties and those faculties. If the balance of statistics is to be believed at all, surely the degree of uncertainty in the total number will be less than the degree of uncertainty in each of its individual subject contents and losses on the swings and roundabouts might well be balanced by gains on the roundabouts. But here we hit a gross contradiction: the rigidity of university structures.

Virtually all university teachers have tenure and most chemists are quite remarkably bad at teaching history (or so I would suspect) and vice versa, so it seems impossible for an individual university, or even all universities together, since trends seem to be on a national basis, to adequately accommodate the scale of fluctuations we are experiencing. We have a structure which is splendid in times of steady expansion, and just tolerable in times of static numbers. In a department which is very inefficient in times of decline and therefore unsuited to the handling of a cyclically varying student intake, even if the oscillations take place about a slowly rising mean.

One way of easing the difficulty



would be to encourage a greater amount of personal movement in the university teaching process, and other fields of work, other forms of teaching or research, perhaps, but not necessarily so narrowly confined.

At present the typical university teacher spends virtually his whole life in the profession; I suspect that many individuals would welcome a spell of change, but only the very brave actually take the plunge because they fear the risk of loss of status not to mention their return, if indeed they are over able to return, to this university world.

With a relaxation of this rigid boundary between university teaching and other jobs, on inflow or outflow, as appropriate, if university teachers would become mobile, of course, the framework within which an individual could move without loss or dislocation of his own personal security and prospects would be necessary.

In many cases there is no doubt that the temporarily superfluous university teacher could be very valuable elsewhere. For example, an undoubted reason for one of our present problems, the shortfall of postgraduate students, is the shortage of properly qualified teachers in schools. In this respect mathematics is perhaps the subject worst affected.

Leaving the fold

I have it from a "usually reliable source" to recall a delightful phrase, that the number of maths graduates teaching in our secondary schools is probably less than half the number of schools and, more generally, the areas of deficiency in schools are those of superfluity in universities. Surely some form of part time involvement in such problem areas of school teaching, or even of chemistry, mathematics, and altogether impossible. In many cases both the school and the individual university teacher would gain.

I recognize, even from that distant viewpoint afforded by government of a school, that we in universities are indeed to lose sight of scholastic problems, and a little closer contact might be salutary even though the difficulties of organization might be considerable. There is also the possibility, often discussed in the past and occurring in a few individual cases, but not extensively developed as far as I know, of transfer, secondment, part time work, regular consulting between universities and government establishments, or private industry and commerce. Again the organizational difficulties are always said to be great, but if the demand for higher education really turns out to be cyclical and largely unpredictable, surely some machinery for such interchange could be established, and it would be clearly required by the prospective university teacher of the outset of his career that, during his lifetime, he would very likely spend several periods outside the university sector.

The details of such arrangements would need careful planning, and one would wish that an individual's own preferences could be met, but there is a good chance that the number of people anxious for a change and challenge would be adequate to ease the problem. After all, any change of job, even between universities, at least on the science side, is becoming very difficult.

If the machinery for freedom of movement into and out of university teaching were available and such movement from time to time were to come to be accepted as normal, then a cyclical behaviour in numbers entering university disciplines could be accommodated, the average staff establishment, as it were, tunnelling through peaks and bridging the troughs of student numbers, the actual staff being available at any one time being increased by not inflow from other forms of education and elsewhere at peak periods and decreased by not outflow at trough periods, thus permitting the intense pressures at present set up within the rigidly bound university teaching profession to be dispersed throughout a much larger reservoir of relevant expertise and experience.

Perhaps this idea is just summer daydreaming and not a workable policy—it is certainly not an original idea, but I am exploring possibilities for improvement of our use of university resources, particularly the most valuable resource, the university teachers themselves, we must not only be prepared to turn over, but must be prepared to turn over the most promising ones several times if necessary.

John Brindley

Dr Brindley is senior lecturer in the School of Mathematics, Leeds University.

Depth rather than breadth



KENNETH MINOGUE

When should an undergraduate learn to be a university? The only immediate answer to this question is more than he possibly can in the three years allocated for most first degrees.

On the other hand, the solution to the problem posed in this fashion is not to increase the length of a course beyond the number of years currently allowed. For all that, a university degree can do is to turn a student's mind towards the problems involved in a certain discipline and the remainder of his education will be the course of his life.

This has always been the situation, and hence there is a certain fatality about those who are excessively

current knowledge, and imagine that the present time is unique in creating a demand that professionals should have constant refresher courses. Education was never a once and for all exercise, and it is not now.

The way in which this problem is commonly formulated is in terms of breadth and depth, a formulation which at least has the advantage of showing that it is an economic problem of dealing with time as a scarce resource, and that it is in principle insoluble. For it is obvious that depth must be had at the expense of breadth, and vice versa.

Those who argue for breadth are commonly accused of being the amount of information they think a person needs in order to come to terms with the modern world. In principle, there is no limit to what one might need to know. Geography and languages for travel. Elementary principles of mechanics when faced with a motor for either a defective dishwasher. The national heritage in order to have some sense of communal identity. Poetry and literature in order to be a whole man.

A smothering of information about Asia and Africa in order not to be perceptive. Some history of science in order to understand the nature of a modern technical civilization. A little philosophy to knit everything else together, and to defend against bad reasoning, and

political systems in order that students should turn into good citizens.

And where would we not pick up a reference to Freud, Marx, Beckett, Kafka and the rest? The list is obviously endless, and to be "educated" in it would be to turn us into amateur polymaths. Such a field of knowledge would be hopelessly corrupting. It is clear that one of the major assets of an educated man is a fine grip on his own ignorance, and that ignorance is one of the major desiderata of any educational programme.

Indeed, for those who seek this kind of conversational competence, there do exist institutions which will be helpful. They are not, of course, schools and universities, but rather correspondence, and journals, which operate very efficiently as liaison officers between the various disciplines and the parts of the world at large.

The answer, then, to those educational imperialists who want to turn the world into a school, and who believe that graduation must not be the end of education is that it is not, and it could never be. Anyone with alert ears and eyes goes on learning throughout his life, just as he looks a great deal when out of formal schooling. It is a mistake to identify education with learning, which is a much wider type of experience.

The real characteristic of education, by contrast, is depth: it is the only thing that can be achieved once we have abandoned the self-defeat

One of the features of depth is that it is not merely an acquisition of a great quantity of information, but the turning of character in such a direction that henceforth being a mathematician, a classicist or an historian becomes an inseparable part of the character of the person concerned.

Another crucial feature of depth of understanding in a particular subject is a degree of sophistication which looks its practitioners to be impatient of journalistic or survey accounts of the subject. For on one who really knows anything about a subject can read textbooks without frequently making reservations about inaccurate generalizations, or reflecting that such and such a popular account is not quite how it is. To be properly educated in a subject is a form of connoisseurship.

Further, its effects are usually not limited to the particular subject in which the connoisseurship has been acquired. To go deeply into anything will, in principle, equip a person with a sense of the depth and complexity of things that will carry over into all areas of life.

For this reason, grave suspicion must attach to anything in elementary education (say, up to graduate level) which is recommended in terms of the word "interdisciplinary."

What it must look like if seen in terms of the conflict between breadth and depth is a way of respecting the notion that education is something else but (what it must be at the beginning) the acquisition of

To study, for example, French literature, is a way of becoming adept in the disciplines of literature. But there is a certain attraction in qualifying this study interdisciplinarily by tacking on bits of the geography, history and economic structure of France, not to mention the French film and the tacy erot of the Beat Myth. It looks like an advance, but it must necessarily be done at the expense of the literature and language from which the study began.

Toss in enough of these indispensable disciplines and education does indeed collapse back into the status of mere acquisition of information—the business of newspapers and journals.

Interdisciplinary studies in universities are the direct descendants of the delirious lure of the problem-oriented "project" in education as carried on in schools: on the one hand, a diversion from what must often seem like the hard grind of chemical tables and trigonometric relations. Possibly indeed more memorable than the standard induction into a discipline; but not, fundamentally, more transfiguring.

In the end, nothing is worth doing educationally unless it is done thoroughly, and smattering one's knowledge, except for limited purposes of induction, educationally is a waste of time. But for many of the practical activities of life, of course, smattering is

Concern grows over loan abuses

We may, in fact, see something like the regionalization of higher education to facilitate joint efforts within a region's capacity. Indeed, we already begin to see this in practice in several parts of the country.

from preceding page

more flexibly. The decline of enrolments in some areas and the growth of others, the emergence of new fields of study and new combinations of fields, pose problems for institutions in what is somewhat superficially called "the steady state" which simply do not arise when change can be followed through growth.

An increasingly required faculty (and new rigidities or proteritisms introduced in some institutions by collective bargaining) only complicate these difficulties. We may well see higher proportions of temporary non-tenured faculty, forming a "reserve army" of teachers, or part-time, which institutions are able to deploy in response to unanticipated changes in both student and market demand, though we know from history that such categories of casual labour tend also to find ways of protecting their interests, and the animus may be there to help them.

We are also seeing many institutions make much more active efforts to recruit non-traditional students of all kinds. (Of course, this applies to those institutions which have not traditionally done so.) I have suggested that American colleges and universities have always been highly sensitive to student demand, and ready also to search out new missions, functions, and clients.

A recent as yet unpublished national survey of American college and university administrators reports that while only 10 per cent of public research universities place extensive emphasis on the active recruitment of adults between 1968-74, well over half of these same institutions intend to do so between now and 1980.

Among public four-year liberal arts colleges, about a third have been putting a heavy emphasis on recruiting these older students over the past six years, while fully 84 per cent of them intend to do so over the next six years. And in the private sector the rhymes on this issue are similar, though from a lower starting point.

These efforts are already finding a considerable response among the adult American population. We ordinarily think of the college and university student as a young man or woman between 18 and 22 years of age. But of roughly 10 million students currently enrolled in American colleges and universities, nearly half are over 25 years of age. (By comparison, only five per cent of students older than 22 constituted only 39 per cent of the total enrolment of 8 million.)

Without much reflection or planning, more in response to student demand than to educational ideology, we are in the United States creating a system which is much more open to adults, offering the chances for learning throughout life to all who want it. We are far from having reached that goal yet, but we are much further along than most observers, even in the United States, are aware.

Historically, many of these older students are women. For example, of the 400,000 students enrolled in the State University of New York, almost 30 per cent are aged 35 or older, and three-quarters of those are women. Women comprise another fast growing segment of the college and university population.

Between 1968 and 1973 the enrolment of women in colleges and universities increased at almost twice the rate of men—growing by nearly 40 per cent over that five year period as compared with a growth of 20 per cent for men during the same time. And indeed, the movement for women's rights which has helped to accelerate the growth in the enrolment of women, is helping to modify college and university rules which have handicapped older and part-time students of both sexes.

Returning to the question of recurrent education, or "life-long learning," even if not articulated in these terms, has a special hold on the American imagination. It seems to point toward the logical fulfilment of the long movement of American higher education toward universal access. Education has always had some of the character of a secular religion in the United States, and when that somewhat evangelical element in our colleges and universities has added to it the stimulus of declining growth rates, then

'The steady-state condition requires fundamental changes in administrative styles and tasks'

Goul and Mannon are working together, and together they are powerful force for institutional change. Emerson said: "The health of the eye needs an horizon." Continuing education, or "lifelong learning" is higher education's horizon. But to translate it into something more than "extension" or adult education is not so easy. We need a good deal of market research, and we need to know how many more adults out there are interested in pursuing formal education, and of what kinds and under what circumstances.

It will need cooperation and perhaps support from business and industry, and also support from the federal government. For example, some thoughtful observers are now beginning to speak of a two-year "educational bank", linked to the social security system, on which people may draw, in the form of enrolment in some post-secondary institution, at any point in their lives.

Now far we will actually have created the learning society by 2000, cannot say—like everything else, it is dependent on a whole set of contingent developments in other parts of our national life. Nevertheless, it is fair to predict that the search for the non-traditional student, for the older student, the part-time student, the non-credit student, and efforts to modify our institutions to accommodate them, will occupy a good deal of the energies and imagination of people in higher education over the next decade—and that is all very much in the American grain.

Parallels in changes in their policies of recruitment and patterns of adult American universities also anticipate changes in the emphasis on their curriculum. Many institutions say that they will place greater emphasis on professional, semi-professional, and vocationally oriented courses, though it is worth noting that most institutions of every kind also say they intend to reduce their commitment to the humanities.

Whether this is possible remains to be seen. It may reflect the familiar phenomenon in higher education that it is much easier to express an intention to increase efforts in one area than to reveal a readiness to reduce efforts in another. But I would return to the issue of changes in the curriculum in another connection shortly.

Most of the discussion about higher education's new emerging problems are directed to what might be called aspects of its public life: levels of financial support, enrolment projections, forms of organization, and governance, aspects of university relations and the like, in short all the questions and issues that bear on the environment of education, rather than what goes on within that environment: the processes of teaching and learning themselves.

These processes, which I call the private life of higher education, are in fact both less visible and less easily measurable, and they figure less frequently in the discussions about current problems that rest so heavily on estimations of enrolments, and financial support.

Moreover, the public life of higher education, what public policy is about and to whom, is not the lowest common denominator of discussion among politicians, civil servants, economists and university presidents.

It may be worth taking a moment to reflect briefly on the implications of steady or declining enrolments for the private life of the institutions of higher education, and to see these broad movements of a society and its educational institutions from the perspective of the people who are actually engaged in teaching and learning, and from the vantage point of the educational process itself. The educational process, in other words, brings them most closely together, their department or college.

First, academic men and women are on the whole currently having to spend a good deal more time

justifying their activities and their uses of resources than they did during the periods of rapid growth. When resources are tight or stable the authorities that allocate those funds, whether they be deans or faculty boards, are under pressure to spend those funds as wisely and prudently and responsibly as they can.

This often means that they want fuller accounting from the spending units on how the money is being spent and more justification for those expenditures, most especially for expenditures on new programmes or activities.

Low growth and tight budgets means many raise a decline in discretionary funds in schools and departments—those funds for which one has no present plans, which are as yet unallocated and thus most difficult to justify, are the first to disappear in fiscal crisis.

In addition, the decline of discretionary funds has effects on the creative life of an institution. There are some activities, such as modest support funds for research seminars, travel funds, funds for visitors, and the like which are now less available or require major efforts to gain and justify.

The opportunity costs to the researcher seeking these small sums may be greater than it is worth to him, or else his usefulness declines rapidly over time and therefore may not be worth the inevitable delays necessitated by applying for it.

I suspect that many college and university teachers would agree that relatively small, easily acquired discretionary funds are among the most valuable funds for the process of education itself. Creative acts, whether in research or teaching, tend to occur spontaneously in ways that are difficult to anticipate or to budget for. And small sums at the

right moment in the hands of the right people have large consequences for the life of the mind.

There is another set of problems that might be called "transitional". These have their source in the survival of a set of activities or attitudes from the period of rapid growth into the current period of slow growth. One of these is the current "overproduction" of doctorates in the humanities.

I have already expressed my doubts about our ability to forecast the demand for educated people very well, and that is broadly true. One apparent exception is our ability to project future demands for new college and university teachers. This of course follows from enrolment levels but the rate of growth of undergraduate enrolments.

Between 1965 and 1975 the demand for additional college and university teachers was running at about 27,500 a year, with the demand for new teachers with the doctorate on the order of 12,000. This is now falling, and by one careful estimate it may, by 1985 have fallen to nearly zero. By contrast the number of doctorates awarded annually has reached 33,000 by 1972 and is now falling quite slowly if for no other reason than there are still very large numbers of doctoral candidates still in the pipeline.

Now it is true that overall only a little over half (56 per cent) of all doctorates take their first jobs in a college or university, and that the proportion varies sharply among fields, ranging from a quarter of doctoral engineers and two-fifths of the arts and humanities.

There is also reason to believe that non-academic demands for highly educated scientists and social scientists will hold up and may even expand somewhat in a society increasingly based on the application of knowledge. Research on energy is the current area of rapid growth in research and development, the successor to the big space programmes of the 1960s.

Moreover, there is a steady educational inflation of jobs. People with doctorates come increasingly to take jobs formerly held by people with lesser qualifications, and in the process, they often reshape the jobs they enter. One recent projection of the National Science Foundation anticipates that "nearly half of all new job openings expected to be filled by doctoral level scientists and engineers in the 1972-1985 period will be in non-academic, non-research positions as compared with one-seventh in 1972".

On the supply side, institutions, without any central direction or plan, are responding to perceived market conditions by cutting back their graduate enrolments and raising their standards both for admission and for the awarding of a degree.

While a variety of market forces and institutional responses may well bring the production of science and social science doctorates into rough equilibrium with the demands of the market, two kinds of problems are visible and troublesome already. One has to do with the content of graduate science education.

In many fields there highly specialized form of education, largely keyed to traditional careers in high level teaching and research, will have to be modified to meet the needs of students who will be entering non-traditional occupations. Though it is not easy for a research-oriented science department to shift its graduate curriculum from an almost exclusive concern for the advancement of science and the training of young research scientists, I believe the movement has already begun in many high science departments.

This is not a development we are likely to hear very much about: this kind of change in the private life of higher education tends to be invisible in those who are not involved in it. But I believe it will be achieved through a kind of division of labour within graduate departments, with the training of research scientists going on the one side with an education for other roles in society than in research and development.

The arts and humanities face a

more difficult problem, especially during the transition to slow growth. In the big research universities, the rapid growth in graduate enrolments and doctorate production in the arts and humanities was almost wholly in response to the enormous growth of undergraduate enrolments and thus of the academic profession in the 1950s and 1960s.

For example, the number of students studying for advanced, i.e. post-graduate, degrees in English and journalism grew from 13,000 in 1960 to over 56,000 by 1971; in the fine arts the growth rises from 9,000 to 24,000 over the same period. Much the same story applies to history, foreign languages and literature, philosophy and other humanities studies.

These are the fields that have traditionally prepared students for work in academic careers. Graduate enrolments in these fields have now levelled off and indeed begun to decline, but they have not done so as fast as has the academic job market, nor especially as fast as the number of jobs in the kinds of institutions for which most doctoral graduate students thought or hoped they were preparing.

There is thus, in some of the leading departments of humanities and fine arts, a serious disjunction between the training and expectations of many graduate students and the likelihood of their getting such training and aspirations. And the situation is not likely to improve, but may indeed worsen, over the next decade in the face of the realities of the academic job market.

What will be done with the large numbers of departments in history, English, foreign languages, philosophy, classics, and so on?

Some will surely be putting more of their time and energies into their undergraduate teaching; some will find it possible to continue their scholarly work with less graduate students to share their specialized interests; still others will find new purposes for their departments, for example, in programmes of interdisciplinary study for older and non-traditional students, leading to a wider range of occupations.

The future and patterns of response to the new situation differ enormously between individuals and between departments, and within the same disciplines, and within every institution, and are affected by such important factors as how long is allowed for the transitional phase, and how much time is available for the slow adaptation of habits to new exigencies.

This leads me to the question of "manpower planning". For it is clear from what I have been saying that there are two broad strategies that are available to departments, many employ, a mixture of the two, or a production of some category of trained person.

One is the response of "manpower planning", to cut back production of this category to meet predicted demand. The other is to modify the forms of training in that field or qualification, to expand the range of occupations for which it prepares people, and thus to loosen the close link between training and occupation.

For various reasons we in America are more inclined to the second response. For one thing, as I've suggested, the big research departments in our leading universities were created largely in response to post-war demand for new academics. These departments, however, came to have a life of their own; they are full of talented professors and can't just be phased out.

Moreover, they continue to perform the research function, the demand for research scientists continues to come to these departments, to the advanced graduate work even when they are warned about poor prospects, and even when funds for them are cut back. I have already stressed and emphasized the importance of the private life of our colleges and universities, the student demand, even if "misguided".

I think our preference for modifying the curriculum and diversifying the training, rather than phasing out production in line with market predictions, illustrates very clearly the difference between the two broad strategies. The one is governed by the training and assumptions of the academic profession. The other is governed by the realities of the labour market and the needs of society.

Elite university systems are

there is a rough congruence between the number of graduates and the number of elite posts. If there is some excess of graduates, they can create new senior posts of elite activity, or be shipped off to faculty, or whatever the institution equivalent is.

Of course, even in a sponsored situation, the highest rewards in modern societies tend to be concentrated, but I want to emphasize the importance of the sponsorship: to be sponsored is to be able to assume early in your education that there will be a respectable place for you in society and the economy after you leave the university.

The transformation of those elite systems into mass systems converts them into competitive systems all the way through. Graduate cannot be guaranteed elite posts.

But the system of expectations appropriate to elite systems survives into the mass phase, creating considerable discontent among the growing numbers of graduates of European universities who do not gain the jobs of the appropriate status and dignity they have been led, in part by history and in part by their parents and secondary school teachers, to expect.

In addition, a growth in the numbers of graduates, and changes in their social origins, is necessarily associated with a decline in the status of graduates, and that is a further source of disappointment and resentment of European university graduates.

This has little to do with their being "overqualified" for the available jobs. Most higher white collar jobs, including technical work, can be done with two years of post-secondary training or six years. The work may be done somewhat differently, but must jobs, and indeed many occupations, are shaped more by the quality of recruitment to them rather than by any rigid conception between an educational qualification and the technical requirements of the job.

In other words, I think that the very concept of "overqualified graduates" is an aspect of the status honour or degradation associated with specific forms of graduate education.



Gareth Williams, professor of educational planning at Lancaster University, and chairman of the conference planning committee.

Governments and tax-payers are becoming more insistent in demanding an answer to the question: "What are universities for?" For universities, you can read it, you prefer, "higher education". Answers are rarely precise: phrases like "pursuit of excellence", "extension of knowledge", "skilled manpower", "serve society" and "extended educational opportunities" are usually proffered.

The last focus on an even more revealing question: "Who are universities for?" Some people claim that universities and polytechnics should be making a greater contribution to social equality. Should higher education be used as a kind of compensatory device to recompense young people suffering from other social disadvantages?

Present financial arrangements have shaped the debate, which provides the theme of the Third International Conference being held at Lancaster University next week.

Excellence means different things to different people. To Lord James of Rutherford, it appears to be synonymous with proficiency at mathematics, philosophy and a short list of "respectable" subjects. To De Hume of Birmingham it means what goes on in Birmingham and a few other favoured universities. To Lord Ashby the "high standard of excellence" is running, assuming a "colour of ability" is an

'Science education must be modified to meet the needs of students entering non-traditional occupations'

with specific jobs rather than of their technical requirements. Manpower planning accepts the traditional links between jobs and qualifications, and tries, above all, to avoid having to place people in jobs with less dignity than their qualifications have traditionally commanded.

It is, in my view, a transfer of the phase of mass higher education, an attempt (inevitably unsuccessful) to translate these rigid links between education and certain horrific occupations into an era in which jobs and qualifications are much more loosely linked.

In the United States, the last survival of this particular elite tradition, with its close link between training and qualifications on one side and specific horrific occupations on the other, has been in the advanced education of professionals, and most particularly in the education for the doctorate in the humanities of people destined for an academic and scholarly career.

The success of "manpower planning" is inversely related to the substitutability of the manpower involved. Most graduates of American colleges and universities, whatever their "major field", are highly substitutable and this includes such highly trained professional groups as engineers, welders, many of whom are found not to be working in the fields for which they were specifically trained within five years of graduation.

But the academic profession is highly conservative in this regard; colleges and universities and their close link between academic posts and specific forms of graduate edu-

cation. This makes manpower planning—or at least manpower planning more "successful" than it is for most other occupations.

The present challenge in many big research departments, especially in the humanities, will be whether they can modify their forms of graduate training to extend the range of jobs and careers available for their advanced graduates—students—that is to increase the "substitutability" of their product. Some I think are already beginning to move in this direction, but how successfully remains to be seen.

Let me point to a similar problem involving yet another kind of response to unfulfilled hopes and expectations among teachers and students. Just three centuries ago, Samuel Pepys, defending the Navy Board against charges of inefficiency and corruption in the recent war with the Dutch, spoke in a vivid phrase of "the costliness of poverty".

He was speaking of the difficulties of meeting the necessities of war in the face of chronic and generally inadequate Treasury disbursements. Credit, he argued, costs money; supplies could not be bought at favourable prices in small quantities and on uncertain terms of payment, and so on.

We also are learning of "the costliness of poverty" in the academy. Buildings planned and designed but not built; in the undergraduate programmes started and stored; in new universities established or expanded, research facilities recruited and their research left unfunded; their graduate students admitted and left unsupported.

But it is not always clear whose interests are being served by some of the claims for equality in higher education.

The two most frequently mentioned sources of inequality in higher education in this country are sex and family background.

In fact a higher proportion of women than of men go on to some form of further education after leaving school, and a substantial proportion of working-class children prefer to take apprenticeships in local industries.

In an era of rapid changes in conventional earnings differentials who can blame them? And is it not arrogant to assume that we know more than the working-class boy who prefers an apprenticeship to a grant?

Excellence is not about preserving the traditional leisure time activities of the privileged classes, and equality is not about forcing everybody to have the same educational experience.

Both should be about individuals developing their talents to the full in the way that suits them best in an environment that is as congenial as economic circumstances will allow. It is in this spirit that I hope the discussions at Lancaster will be undertaken.

There are obviously many practical issues that cannot be avoided at the conference. What should be the criteria of access to higher education? Many Europeans will want to discuss the pros and cons of numerous closures or limited access. A paper from China will show how peasants are brought into universities towards the end of their service to the commune.

The role of research in higher education will come under scrutiny. Can the polytechnics achieve real parity of esteem until they have the same research role as the university?

If so, does this mean that excellence in higher education resides really in the research function? And if so, what about Oxford and Cambridge and the French grandes écoles, whose academic reputation results from their tradition of undergraduate teaching?

We see the costliness of poverty when long-standing library subscriptions to scholarly or scientific journals are broken, or special collections are not longer kept current, or when full professors type their own letters or spend their time filling out forms.

It is difficult to say how great are the costs of the new situation in unfulfilled plans and hopes in American colleges and universities; the very great number of institutions affected, and the enormous range in their situations makes it difficult to know what the costs have been.

Indeed, the level budgets that make impossible the expansion of graduate work and research, and thus force significant institutional mobility, are, in an observer's eyes, only by comparison with earlier extravagant hopes and ambitions.

The deprivation in many cases is more relative than real. But we know from studies of reference group behaviour in many areas of life that a sense of relative deprivation can be a sharp source of discontent.

One central dilemma that we are now facing takes the form of a tension between centralization and diversity. On the one hand the slowing down of growth and the tightening of resources both tend to strengthen the centralization of academic decision-making.

The tendency toward stronger central control occurs at every level of higher education: of chains over their departments, of deans over their schools, of presidents over their colleges and universities, of chancellors over their multi-campus systems, of state administrative

agencies or legislative committees over the whole system.

On this question, I think it fair to say that the American education scene is a striking tendency of higher education under current conditions is for authority that has traditionally been widely dispersed to be more highly concentrated. This is a concentration of power that is to the free-wheeling dispersion of power and initiative of the decades of rapid growth.

Increasing centralization of academic authority has several sources. In particular it appears to be a result of more efficient management, both of funds and of other resources such as personnel and space, than is possible through the loosely cordoned, autonomous decisions of many smaller component units, whether the individual faculty members, departments or campuses.

I should make clear that I have reservations about whether the efficiencies thus pursued or achieved are in fact genuine efficiencies in the achievement of desired educational outcomes, rather than the artificiality of accounting systems. In the latter case they may well be to the expense of the effectiveness of academic programmes rather than to their benefit: much hinges on what outcomes of higher education are taken into account in the assessment of its efficiency, and how those outcomes are measured.

In any event, whatever my views on this matter, concentrated control, especially as located in state agencies and departments of finance, tends to see control management as inherently more efficient than the dispersal of authority to what appears to be the outside in the something near to organizational anarchy. And whether or not they are right, they have enough power to press these institutions toward a greater centralization of both authority and responsibility.

An edited version of a paper delivered by Professor Tron to a conference in London in May, 1975, on the impact of low growth for higher education.

One of the favourite claims of those who seek a larger share of a smaller pool of resources is the need for centres of excellence. But what exactly is a centre of excellence?

In an age of telephones and rapid transport by road, rail and air, libraries, laboratories, photocopying facilities, and, of course, international conferences, how necessary is it to have many of the leading scholars in the same city or state, or concentrated in a particular institution?

Conversely it is economically viable to fragment academic activities, particularly research activities. Obviously where scientific research is heavily capital intensive it must be concentrated in a few geographic locations, but access to research facilities by scholars from other institutions.

What about the argument that it is departments within a university rather than whole institutions that should be centres of excellence? How will a department that is a centre of excellence in a faculty be regarded by other departments that are not so favoured?

Should the financial resources of the research councils be increased so as to safeguard the financial need of excellence in individual institutions and departments or by individual scholars, while equality of treatment as far as teaching is concerned is assured through University Grants Committee (U.G.C.) and the local authority point?

In the United States the dilemma between excellence and equality appears to an outsider at least to be resolved by the excellent private graduate institutions.

Undergraduate courses are in all intents and purposes open to all and the academic standards are often not high. But the excellence of the American PhD has been maintained in highly competitive graduate schools where students have to work really hard.

It is worth reminding those who consider that mass higher education is inherently inimical to excellence that United States scientists regularly collect most of the world's Nobel prizes, and that George Mel-

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The conference will be fully



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The danger of putting faith in science

Perhaps it was inevitable. In his presidential address to last year's annual meeting of the British Association for the Advancement of Science, Sir John Kendrew spoke of the danger of the extent to which science was useful in achieving social goals, and worried of the dangers to our technological and economic development if scientific research was starved of funds. His successor, Sir Bernard Lorell, addressing this year's conference at the University of Surrey, produced the counter-argument: there is a great danger in putting too much faith in science as a simple solution to the problems of society; we should seek its true value in the transcendental realm of "materialism" and "happiness" (even if current theories about the beginning of the universe make it necessary for us to put these values on some type of materialistic foundation).

Sir Bernard's concern is understandable. A naive faith in science as the route of social progress is as misleading and potentially dangerous as the attitude which contends that science exists independently of society and of human understanding. The former case is argued by Michael Fores on the opposite page. No one disputes that modern science is a necessary activity of any society which depends for its existence on the functioning of a vast technological complex; what is disputed is that science, or in an even more limited sense, the occasional flashes of inspired genius, is sufficient to maintain and develop this complex.

In a sense, too, Sir Bernard's presidential remarks to the BA seem destined to strike a chord of understanding with many working scientists. Last year, when science appeared to be under attack for its failure to relate to the needs of society, scientists found themselves at a result of their defence that even research of the most fundamental nature is likely to lead to an eventual economic or technological payoff. Thus we find at the BA's present meeting a full-day symposium in which the research councils have promised to expose themselves to public scrutiny, with a final session under the title "some benefits of fundamental science" addressed, among others, by Sir John Gray, secretary of the Medical Research Council.

Within the last year, however—and in the period since this year's BA programme was planned—the effects of universities and research laboratories of the country's declining economic situation have led many scientists to question the value of their "research" and to argue the need to defend science as an activity of intrinsic value.

Of course any advanced industrialised country needs an active scientific community if it is to continue to develop in a technological sense. But scientists argue that "nevertheless we should not let our eagerness to 'know' science to social ends blind ourselves to the fact that the true nature of science lies in the human search for knowledge and understanding, not in the benefits which may flow from it."

Having said this, it is with a sense of relief that scientists feel able to relinquish any qualms they might have had about the need to justify their work in terms of its social usefulness. Scientists are never particularly happy arguing about what "social responsibilities" they may or may not have; the fascination of the laboratory bench, the abstract nature of the scientific method,

apparently indeterminate and "mystery" process of social and political life. When the former are secure, the latter can be discussed casually over coffee; when the former are threatened with economic survival, then the lines of defence contract and are hastily erected around what only last year Sir John Kendrew referred to as an activity that might appear, to future historians similar to the "putting-down" of the "mystery" of medieval times.

The dangers of such a shift are immediately obvious. Within the higher education sector as a whole, the pressures of economic hardship are becoming expressed directly in terms of social and political choice, hence, for example, the "debate" over the future of the higher education as a theme for next week's international conference at Lancaster University. Similarly within science any attempt to resurrect the argument for supporting science essentially as a socially autonomous activity of intrinsic cultural value can only challenge any political moves to give priority to maintaining the material—rather than spiritual—well-being of the whole community.

Equally, shifts in attitudes can only be related to shifts in underlying economic and political factors which they then come to reflect. A return to the argument in defence of pure science can be directly correlated with both economic threats to the survival of research scientists and in a broader sense to the growing challenges to prevailing notions of "law and order" that govern the world of men. When the political issues appeared simple, they fitted neatly into a moral view of the world that the scientist could easily comprehend within his picture of an orderly universe to compare with the chaotic world of the political arena. The Vietnam war, regulated to great analysis of the political issues at stake, and could be done almost as simply as voting in the EEC referendum.

As political problems come nearer home, however, such simple views of the world become more difficult to maintain. The effects of inflation and the resultant Government policies, on the one hand, and the growing militancy of the trade union movement, on the other, require a choice of values that cannot be made so easily. The scientist might like to merely in terms of stating a preference for order over chaos. The important question now is what type of order is to be preferred. In the 1930s planning and socialism were virtually synonymous, a factor that provided a crucial component in the political activities of scientists such as J. D. Bernal. Today the imposition of a centralized, bureaucratic type of social order has become to many one of the less acceptable faces of capitalist society; yet any attempt to resist this order for the individual within the social structure poses immediate problems for the scientist eager to achieve a compatibility between his interpretation of the underlying orderliness and objectivity to fundamental laws—between the natural and the social world.

To retreat to the laboratory bench may provide temporary respite from this problem, but can only confine, rather than solve, the underlying dilemma. For, as Michael Fores argues, to accept and propagate the values of science as an essential ideology can only serve to obscure acquiescence to prevailing economic, social and political forces. In no way can it be said that the affairs of men are made by men—whether for good or ill. To resort to an idealistic faith in the second coming of a "scientific genius" that will remove our problems with the stroke of a test tube is to lay ourselves open to the fallacies of scientism, open to the fallacies of scientism that have not only

LETTERS TO THE EDITOR

Academic salaries

from Mr Jonathan Shum

Sir—Dr Radford's justifiable lament (*THE TIMES* August 15) is surely shared by those in polytechnic-type institutions throughout the United Kingdom. But it may not be generally known yet that a growing number of university lecturers or researchers are beginning to favour a relatively radical idea of having a common salary structure, based on (if not entirely) Houghton, for academic staff responsible for both university and CNA under-graduate degree courses.

This phenomenon was much in evidence at informal meetings of several scientific conferences which I have attended since publication of the Houghton Report.

Perhaps for the first time, grassroots academics, particularly the younger ones, want to talk to one another, breaking down the hitherto "them-and-us" barrier, and may soon exert appropriate pressure in effecting a rapprochement.

The general views, as I saw them, were that (a) such a common salary structure was desirable and was in the interest of the future of British higher education, (b) to give due recognition to those with substantial research experience/programmes and postgraduate supervision load, especially those who could claim "international reputation" (whatever that might mean), there might well be an additional research scale superimposed on the common salary scale, and (c) if the non-university staff were to accept the above principle gladly, their needs for and claims on the nation's resources for academic and technological research must in future be given the same favourable consideration which their university colleagues always received.

Although the majority of the university participants at these informal discussions were in the lecturer grade, I can recall at least three department lecturers and one professor (admittedly he only got his chair two years ago) who have also come out in favour, on principle, of this "come together" idea.

Like most new and perhaps radical attempts to tackle any complex problem which is bedeviled by old prejudices and new jealousy from both sides, this one will be criticized and branded as "simplistic" or worse.

But I should like to point out that this movement has started, is likely to grow, and deserves wide attention and realistic but urgent evaluation by all who have our

higher education's future at heart. Pioneers like Dr Radford need not be disheartened. Let us keep talking to one another through, and if need be by writing, at some stages, our professional representatives. Yours faithfully, JONATHAN SHUM, Department of Social Sciences, Glasgow College of Technology.

from Mr M. F. Morrison

Sir—While agreeing with your editorial view (*THE TIMES* August 15) that a neutral assessment of the salaries issue is necessary, I am amazed that you should be unaware of two basic flaws in your argument that a broad comparability of salary scales in universities and polytechnics will be achieved if the AUT accepts the latest Department of Education and Science salary offer.

The scales you quote as evidence of this comparability are based on a 1974-75 settlement for polytechnic staff based on a 1975-76 settlement for university staff. Clearly any comparison must be based on 1975-76 settlements for both sectors; since polytechnic staff will doubtless receive a £312 rise in April, 1976, your argument that broad comparability has been achieved simply is not true.

Secondly, the university lecturer scale has 16 points whereas the lecturer 1/academic lecturer scale (the polytechnic equivalent for staff doing degree level work) contains only 14 points.

Increases are therefore greater and polytechnic staff reach the top of the scale two years ahead of their university counterparts.

Unless these two anomalies are eliminated broad comparability between the scales in the two sectors will never be realized.

Yours faithfully, M. F. MORRISON, 3 Foxroyst Avenue, Mirlfield, Yorkshire.

from Mr Leslie Wagner

Sir—Heads I win, tells you I see? In 1974 university teachers were clobbered because we negotiated and settled our pay whilst wage restrictions were in force even though the settlement itself came into effect when there was no restraint.

In 1975 we are clobbered because although we negotiated and settled our pay when no formal policy of restraint was in force this comes into effect after such a policy has been introduced. Will someone explain the logic of this state of affairs, please?

Yours faithfully, LESLIE WAGNER, Faculty of Social Sciences, The Open University.

French exchange

from Miss Mary Wynn

Sir—The article by George Morgan on student interchange between Britain and France (*THE TIMES* August 1) has unfortunately given rise to some misunderstanding, as the letter from the University of Sussex (*THE TIMES* August 9) shows. The two papers mentioned by Mr Morgan have not in fact been published; they are working documents being prepared for a joint meeting of the British and French authorities.

The British contribution, for which this department was responsible, was circulated in draft to a large number of institutions and individuals in this country and has been generally approved, but some late alterations may still be made. The French authorities, for their part, are considering amendments to their paper which we have suggested.

One of these concerns the reference to UCCA to which Mr Morgan and Miss Broadway from the University of Sussex have taken exception. Our own paper makes it clear that this procedure applies only to first degree courses. There are separate sections about postgraduate studies and about shorter periods in British universities. It is the French paper, not, as the article seems to indicate, the

cedura limits freedom of choice, and we have suggested to the French writers that they might reconsider this passage.

My colleagues in Paris, far from "discouraging" potential students (and more senior academics) from coming to Britain, are doing all they can to stimulate such visits. The paper which we have submitted is designed to show that there are not "almost insurmountable financial and administrative hurdles". Though we could not do otherwise than state the problems of finance, we have as the article states, drawn attention to ways of surmounting them. So far as administrative matters are concerned, the text of our report is that these set no more problems for French than for British students.

This joint presentation of the facts was, as Mr Morgan says, requested by a meeting of French and British academics in order to help each side to identify and overcome the obstacles inhibiting student exchange between the two countries and in particular to encourage more French students to come to Britain.

Yours faithfully, MARY WYNN, Director, Higher Education Department, The British Council.

Civil Service fees

from Mr D. L. Munby

Sir—There may be many teachers in higher education who give occasional lectures in the Civil Service College or assist the Civil Service Department in fee paid work. Not all will know the bureaucratic hazards to which they may submit themselves if they undertake these tasks. Normally, but not always, they will be sent a brief note about income tax (SP 27/31/01, dated March 1975), and perhaps some information about national insurance. But they may not realize without careful scrutiny quite what this involves.

Someone who gives an occasional lecture for a fee under ordinary circumstances is taxed under schedule D (and perhaps mostly pays tax at more than the standard rate). He expects to be paid expenses for travel from his home base, and other out-of-pocket outlays, which are not taxable, separately from the fee as previously in the Civil Service Department. His tax return will be straightforward.

The present procedure of the CSD is to treat every casual lecturer, etc., as if he were employed at the place where he delivers his lecture, and so to deduct tax and national insurance under schedule E (PAYE).

Expenses are *de facto* treated as if part of the remuneration. If the lecturer were indeed employed at the place where he lectures, his journey to work expenses could be claimed as tax deductible.

The CSD, however, graciously pays expenses grossed up at the standard rate or, if the proper forms are sent in, at more than the standard rate. But there is no guarantee of the correct grossing up, especially to the casual lecturer, so that actual exchequer cannot automatically be paid.

In the case of national insurance, a "self-employed" lecturer may be exempt, or contributions may be payable if he already pays the minimum to his local authority (form R231674/CC) for national health insurance details, but the finance division of the department does not (at least sometimes) deduct the national insurance contribution without asking for the details which alone would enable it to be credited to the right scheme.

Man's creativity is widely considered one of his special gifts. One writer who has dealt with it is Arthur Koestler; unfortunately the bias of his cultural stance means that his thesis is generally misleading, and in its details, at least partially invalid.

In the *Act of Creation* Koestler aims to record aspects of man's genius, particularly ways in which achievements are brought about by the creative process. He deals mainly with the history of art and architecture, only a little with science and useful techniques of manufacture. Newton and Brunel are mentioned, but not Ampere or Kelvin; Leonardo da Vinci is dealt with as a painter and sculptor, not for the 20 years which he put in as an engineer for the Duke of Milan.

The question raised by Clark's work is totally different from that raised by Koestler's. The worry about Koestler was that he had not covered all aspects of his subject; for Clark it is that he is not faithful to his own expressed interest.

In one passage, Clark argues that Western civilization is the subject of his presentation, and that he is not in the Dark Ages by its craftsmen; but if craft was important at that time, and civilization is the obverse of barbarism, then crafts and useful techniques are surprisingly neglected. There is also a surprising neglect of the special influence of science in helping to free the world from barbarism through its attack on ignorance and superstition.

So far this article has dealt with aspects of man's culture and his special genius. Sadly, misstatement of both stems partly from major misconceptions about science, especially in our Anglo-Saxon sub-culture. The argument which follows aims to restore science to the place it should—and used to—hold.

In his book *Public Knowledge*, the physicist John Ziman deals with various ideas of science, and concludes that to describe science as the mastery of men's environment is a "ruler conception". Following Ziman, who are the culprits in this art of vulgarization? They are those who talk of "homemade" activities as being part of "applied science", for recent study has shown that technical advances, even today, are not typically caused by the direct application of scientific knowledge.

Another set of culprits are those who claim to be engaged in "science policy", even though this kind of policy is defined to include only

Some time ago I wrote an article critical of the idea that there is a unique important "real cultures" gap in our Western society. I argued that to claim the existence of a single divide between "science" and "the arts", along the lines of C. P. Snow's thesis, is misleading for analysis of the culture. For a similar, and possibly more important, cultural split can be discerned between the reactions of practitioners in the useful arts and professions (such as law, accountancy, medicine and engineering) and of those in all areas of scholarship, science and the "fine arts" (such as physics, history, biology, sociology and literature).

This second gap might be described as one between "technology" and the rest. Exponents on one side assess phenomena for their utility and react accordingly, whereas exponents on the other are concerned with phenomena being interesting.

Although this gap may appear wide at times, the best general assessment is that we, in the West, all live within the influence of a broadly unified single culture, influenced alike by science, art and useful techniques. Such an assessment is supported by a powerful general conviction that things which are more likely to be more useful than things that are false.

While maintaining the one-culture conclusion for Western society, it is important to note that assessments about the culture and human achievements often contain an unfortunate bias. There are two dominant descriptions of the distinctive characteristics and achievements of the species, each based on ways in which man's (and woman's) creative genius affects civilization and the culture.

In one description man is the thinking animal, unique in his ability to use reason to solve problems posed. So he is distinctively *homo sapiens*, the reflective creature and wise after a fashion. The second description sees man as unique through his ability to make and use tools to extend his direct and personal powers. So he is distinctively *homo faber*, fixer and activist.

Of these two descriptions, the second seems both more important for understanding what is special about man, and the less well recognized, at least by most of those who discuss creative achievement and the nature of civilization.

The most misleading part of Snow's cultural analysis is that it hails the engineer and the technician, man to be part of the group of "scientists". In truth the technical man is distinctive of *homo faber*, whereas the natural scientist is distinctive of *homo sapiens*.

The engineer, with a title which stresses, in all languages, his capacity for creative thought, with or without a knowledge of science, is the typical fixer, the scientist, with his search for knowledge and understanding with or without a capacity to make his own experimental apparatus, is at the very least among the most typical of sages.

Man's creativity is widely considered one of his special gifts. One writer who has dealt with it is Arthur Koestler; unfortunately the bias of his cultural stance means that his thesis is generally misleading, and in its details, at least partially invalid.

In the *Act of Creation* Koestler aims to record aspects of man's genius, particularly ways in which achievements are brought about by the creative process. He deals mainly with the history of art and architecture, only a little with science and useful techniques of manufacture. Newton and Brunel are mentioned, but not Ampere or Kelvin; Leonardo da Vinci is dealt with as a painter and sculptor, not for the 20 years which he put in as an engineer for the Duke of Milan.

The question raised by Clark's work is totally different from that raised by Koestler's. The worry about Koestler was that he had not covered all aspects of his subject; for Clark it is that he is not faithful to his own expressed interest.

In one passage, Clark argues that Western civilization is the subject of his presentation, and that he is not in the Dark Ages by its craftsmen; but if craft was important at that time, and civilization is the obverse of barbarism, then crafts and useful techniques are surprisingly neglected. There is also a surprising neglect of the special influence of science in helping to free the world from barbarism through its attack on ignorance and superstition.

So far this article has dealt with aspects of man's culture and his special genius. Sadly, misstatement of both stems partly from major misconceptions about science, especially in our Anglo-Saxon sub-culture. The argument which follows aims to restore science to the place it should—and used to—hold.

In his book *Public Knowledge*, the physicist John Ziman deals with various ideas of science, and concludes that to describe science as the mastery of men's environment is a "ruler conception". Following Ziman, who are the culprits in this art of vulgarization? They are those who talk of "homemade" activities as being part of "applied science", for recent study has shown that technical advances, even today, are not typically caused by the direct application of scientific knowledge.

Another set of culprits are those who claim to be engaged in "science policy", even though this kind of policy is defined to include only

Science, culture and national laziness



(r to l top) Francis Bacon, Isaac Newton, (bottom) Maynard Keynes and Charles Darwin, four of Britain's greatest scientists, each of whom was rejected, or was rejected by, Cambridge University.

Michael Fores argues that misconceptions about science as a cultural activity have led to unwarranted faith in 'recumbent heroics'

of civilization. Like the results of creativity, various aspects of our civilization are objects which we pride in the general culture. Although Lord Clark comes nearer to a full perception of his subject than Koestler does, the treatment is again limited. Clark claims that it was the word "civilization" which persuaded him to undertake his famous television series. In a book based on that series, he explains that, unsure at first what civilization meant, he only knew he preferred it to barbarism.

Possibly a group of people can become bored by civilization, but Clark claims very reasonably: "The boredom of barbarism is infinitely greater. Quite apart from discomforts and privations, there was no escape from it. Very restricted company, no books, no light after dark, no hope. On one side the sea battering away, on the other infinite stretches of bog and forest."

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research and development work, it is still massively misdescribed, since more R & D is technical than scientific.

Sadly to say, however, is that prominent and misleading among the vulgarizations of science are many of those who have tried to describe it to the layman, or who are searching for an element of social responsibility. Jacob Bronowski, for instance, made a plea in his *Common Sense of Science* for "one universal language" for science and the arts, but was still able to describe washing machines as being among the "products of science". The paintings of Picasso or the sculptures of Rodin could be similarly described through the artists' knowledge of materials.

Jerome Ravetz, in *Scientific Knowledge and its Social Problems*, was similarly keen to widen his subject area towards the "vulgar" conception. He committed the first cardinal error of science itself by refusing to adopt a consistent definition for the phenomenon under observation and deliberately using the term "science" itself in different senses throughout his study. Both these studies lose credibility right from the start.

To help restore science to its proper place in the culture (and incidentally as a necessary first step to encouraging responsibility among its exponents) we must first remind ourselves what science is, namely knowledge or a body of knowledge, rather than products or production which follows the presumed use of that knowledge.

To see science in its rather special place in the British part of Western culture, two assertions are made. Neither is fully supported and neither too readily tested. The British and Anglo-Saxon "two cultures" aberration stems from our rather special national laziness. Moreover, it contributes to it.

Many of the great names of Western thinking are British and we know it. Consequently we give a particular importance for the solution of perceived problems, to frankish goals rather than to concerted and sustained application, the kind of sustained work which I have argued that Koestler, a naturalized Briton, has failed to pick up in his treatment of creativity.

Extending briefly this analysis of special laziness, we inevitably tell ourselves a version of the story: "The situation in front of us most certainly is a problem." It all looks very difficult at the moment, so we cannot even begin to think of a solution.

Problems like this, however, have occurred in the past without hovering the island race. Newton was one of many and Darwin and West and Stephenson. So were Keynes, Adam Smith, Henry V. Drake, Bacon, Wellington, Queen Elizabeth, Nelson, Mitchell, the Spitfire man, Watson-Watt, the radar man, Whittle, Lord Kitchener, Cary Grant, The Beatles and many others.

Where science is concerned, we have been winning Nobel prizes even in days of our

relative decline since 1945. So surely our applied science cannot be so much in a science is up to scratch. Something, or more exactly someone, will certainly turn up. A freakish island genius, quite possibly, a scientist, will do the trick.

Why, one might well ask, should science be so central to this analysis? and how would a different conception of science help? I happen to believe that science is central to the culture and to an understanding of it. For all the fool-making and bomb-throwing which has gone on over the years, science (natural and otherwise) provides one of man's greatest achievements and the search for truth one of his greatest aspirations.

As implied earlier, however, it has often been the scientists who have sold science down the river among their own men of genius and of special distinction, they must have discerned the special Anglo-Saxon laziness.

Only in this way could they be sure of the success of siren promises that science will bring prosperity with its flash of inspiration. Only in this way could they be so successful when it really begins "applied science" argument that they have used in persuasive no adoring world that would technique is just, an extended part of science itself.

What total nonsense this all is! And what an arid quest to ask if a Farai or a Marconi or an Edison was an educated man, if a Watt or a Morse knew his basic science. In every case of major technical advance, the most crucial factors have been the pioneer's conviction of the value and importance of the needed and utility, coupled with his ability to worry his way through to his goal.

It is partly, I contend, lay talk of "technology" which has ruined scientists and others. Search around the literature and you will find that whenever this monstrous con- ception is introduced into discussion, reason goes out of the window!

In conclusion, I have tried to point out that all the studies referred to, except Ziman's, fall down significantly in their treatment of the general culture. At least four lessons arise. One is that recent in the dramatic texts to make the observer lose sight of the typical. Whatever happened in certain cases, typical technical development, which influenced life profoundly, is almost always divorced from the development of science.

Thus the "technology is really applied science" argument incorporates a massive misreading of events. Even useful artifacts which result from unusually creative effort are rarely the fruits of "applied science" as such.

A second lesson concerns an aspect of the special British sickness, our laziness. To the study already referred to, Bronowski's contrast two 17th-century traditions, as shown up by two great men. "Characteristically, Descartes did most of his scientific work in bed; and Bacon died of a cold which he caught . . . when at the age of 65 he tried the experiment of stuffing a fowl with snow."

Other evidence does, in fact, support this brief depiction of what was typical of British and English thinking of the time. But by the twentieth century, roles had been reversed. It is the English who now have their recumbent heroes, whereas the French have become fonder of tireless workers.

Every English boy who has studied science or the classics has Archimedes as one recumbent hero, whereas Keynes is remembered as having made money for part of the foremost English shrine, King's College Cambridge, similarly from a bath.

A third lesson concerns the English shrine which is alma mater of our scientific tradition. Without too much fear of contradiction—and by defining science widely to cover all forms of scholarship—our four most famous scientists of history have been Bacon, Newton, Darwin and Keynes. All were rejected by the University of Cambridge or rejected it themselves.

Bacon studied law there, but achieved eminence on his own. Newton was eased out for his personal beliefs, as was Bertrand Russell. Keynes despite a long association, gave up his lectureship well before producing his best work, which was done elsewhere. Darwin was awarded a pass degree. For all the fame of Rutherford, a foreigner by birth, the record suggests that our scientific shrine has not been so sympathetic to the development of science itself.

The last lesson is the central one. Analysis of the culture, strongly influenced as it is by science, is not, in the event, so different as some attempts make out. For the first steps to take are the same as they always have been, and stem from an era well before scholarship became influenced by matriculation or science dealt with the idea of cause.

Choose your topic. Decide what the words mean. Classify. Then fire away. Too many scientists have failed to contribute cogently to general and cultural analysis through neglect of the first basic steps of science itself. Others have failed too, of course. But many of us had hoped for something extra from science.

The author is a member of the Government economic service; but all views expressed are personal.

Robert Dowse

Automated map making

Elements of Spatial Structure
by A. D. Cliff, P. Haggett, J. K. Ord,
H. B. Hassel and R. Davies
Cambridge University Press, £6.80
ISBN 0 521 20689 8

Display and Analysis of Spatial Data
Edited by J. C. Davies and M. J.
McGill
Wiley, £12.00
ISBN 0 471 19915 X

Location and Space in Social
Administration
by Bryan Massam
Edward Arnold, £6.30 and £3.15
ISBN 0 7131 5776 3 and 5777 1

It is now ten years since Peter Haggett's *Locational Analysis in Human Geography* established quantitative-theoretical geography as a recognizable part of British geography. This trend towards quantification is usually interpreted as part of a movement in geography from description to analysis and the early theoretical developments were almost exclusively spatial or even simply geometric in nature. Some much of the work relating to this school of thought in both undergraduate courses and the research literature has come to be known as "spatial analysis". After its initial rapid growth within geography this spatial school has stabilized in the last few years as further new developments in more behavioural and politically conscious approaches have drawn their quota of new adherents to the discipline. However these three books are all explicitly spatial analysis and attempt to contribute to the spatial school.

The University of Bristol has been widely recognized as the centre of the diffusion of these new trends in geography through the work of Michael Chisholm, Peter Haggett and David Harvey. *Elements of Spatial Structure* reinforces this viewpoint as it reports on the work of five Bristol researchers. In the late 1960s and early 1970s, although Haggett is one of the five authors, this book should not be considered a revision of his *Locational Analysis*, being in some ways a much more ambitious book as it attempts to lay bare "certain basic and primitive properties of space, elements upon which more sophisticated models must ultimately depend".

The chapters are divided into three parts: "Static Aspects of Regional Structure", which includes discussion of mosaic patterns and surfaces; "Dynamic Aspects of Regional Structure", which is concerned with comparing time series components over space; and "Autocorrelation and Forecasting". Much of this material has been published previously and this particular organization does not really bring the material together to a coherent pattern.

However it is not meant to be a

definitive statement reference on elements of spatial structure and the authors are very careful to point out that the work is in no way complete but simply represents the fruits of their efforts to date. For instance the problem of invariance of the parameters of some smoothing techniques to orientation of the coordinate system is left unsolved in chapter four and in chapter ten the general forecasting models (STARIMAR) parameter estimation procedures are noted as a subject for future research. However there are very many more instances where the authors have broken new ground in spatial analysis.

They have achieved this in three ways. First they have introduced and adapted time series and forecasting approaches into a spatial context. Secondly they have developed the statistical apparatus required to use these adaptations correctly. This is most fully developed in part three in terms of deriving the sampling distributions of measures of spatial autocorrelation and parameter estimation for space-time forecasting models. Thirdly they have introduced parts of the statistical literature and applied it to familiar geographical problems. Geographers have long bemoaned the lack of statistical interest in their problems without fully knowing the statistical literature. Many have suspected that there was more relevant material from this source than geographers have been aware of. A good example of this is the introduction, in chapter three, of the Whitworth and Cohen models from the literature on "spacings" which enables the authors to dismiss the familiar rank size rule as "having little more than historical interest". A major objective of the book is to provide a quantitative approach in geography was that it would make the discipline more rigorous in its research methods. *Elements of Spatial Structure* fully justifies this expectation.

While geography was becoming more quantitative, cartography was becoming more automated. Both developments have become closely related in terms of dependence on computers and common interest in map properties. This is simply because automated map making requires the production of a quantitative map in a quantitative sense. Hence there has been a parallel trend towards more rigorous consideration of map properties often overlapping with the more direct geographical interest in spatial analysis. *Display and Analysis of Spatial Data* is a volume of 22 papers written by participants in a NATO Advanced Study Institute on this topic held in Nottingham in 1973. The papers are divided into three groups relating to theoretical aspects, automated cartography and practical applications. There is some overlap with the previous book in the theoretical parts where Cliff and Ord discuss spatial autocorrelation again and there is a paper by Tobler on linear operators.

However this volume is very different from *Elements of Spatial Structure*. The most obvious difference is in its range of approaches reflecting researches from six countries in several disciplines. We are reminded that spatial analysis is much more than a dialogue between geography and statistics. In fact many will find the three papers by geographers in the theoretical section the most interesting as they describe work on "regionalized variables" whose theory has been developed into the Kriging optimum interpolation approach in isoline mapping. The papers on the automated cartography range from a review of the primer paper by Coppens and his colleagues to a solution of problems in depicting relief by Sprunt with finally a description of several computer graphics systems including a description of the Harvard University programmes. Unfortunately the final set of papers on practical applications do not constitute a very coherent group some being more related to the earlier theoretical papers than applying any computer cartography. None the less this volume represents both an impressively broad coverage of the state of the art in this field and reflects previous failures to integrate theoretical work as evidenced by the lack of referencing among researchers from different disciplines. I expect that the institute and this volume will be instrumental in breaking down this academic isolation.

Location and Space in Social Administration is much more specialized than the other two books. Much of the discussion consists of applications of parts of spatial analysis to the design of administrative areas. Numerous models of shape are reviewed to derive an index of spatial efficiency and several location models are described and applied. However the subject matter requires more than simply spatial analysis since, in practice, social and political issues transcend spatial efficiency. The spatial school in geography has been accused by its critics of being rather naive when it comes to political matters and unfortunately this book supplies evidence to support this view. The topic of "control and decision making" is relevant to the final chapter where a rather huge literature on the relations of politics and administration is presented in 15 pages. When geographers stay within the confines of spatial elements and computer graphics they can avoid such political issues in their work but when they start clearly in the realm of public policy, the implications of their work under varying political assumptions must be made explicit. Massam's failure to adequately cover these political aspects makes his book particularly disappointing for those who feel that spatial analysis must begin to be more practical while continuing the development of its theoretical bases.

P. J. Taylor

Topology and complex analysis

Complex Analysis, M332 13 and M332 46
edited by R. J. Knight
Open University Press, £4.45
ISBN: 0 335 05550 8 and 05531 6

The authors have tried in the collection of papers to provide a more readable book. Despite this, there are many errors in the three volumes. The authors obtain a general form for Cauchy's theorem for star-like domains very neatly. There is a good selection of carefully graded examples in each section so that the student is led in to some powerful results. However, some results for example the Riemann-Roch theorem, and some versions of the triangle inequality seem inappropriate enough not to have been relegated to exercises. Some results are quoted without any proof.

These books are garrulous at times, and though this may make study easier for Open University students, it does tempt the authors into making long statements some of which are actually incorrect. Since

students may wish to consult other texts it would have been desirable for the authors to point out that amplitude is an alternative usage to argument; their convention for $\log x$ and $\log z$ is the opposite of that used by some other books and the complex plane is sometimes called the Argand plane. Each volume covers a narrow field and university students may find them expensive.

Each text is composed of three units. Unit 1 on complex numbers gives a good introduction to the elementary definitions. In unit 2 on continuous functions the discussion on the continuity of a polynomial function might have been enlarged. It is followed by the field statement that "any rational function is continuous". The question may be remembered the earlier statement that the domain of a rational function does not include any zeros of its denominator. Unit 3 covers differentiation. The development is made difficult and clumsy by presenting a result which is not taken by students without any knowledge of partial differentiation. The result is that the classical Cauchy-Riemann equations come near the end of this unit.

Unit 4 is on integration. Theorem 4/4 and all deductions from it are unnecessarily true despite the reference to Spivak. It is regrettable that the context between the definition of a contour integral as given and the more obvious Riemann sum form is not discussed. Cauchy's theorem is the subject of deduction of Cauchy's formula. It is made to depend on an unproved lemma for integration by parts of contour integrals. It would have been instructive to justify differentiation under the integral sign with respect to a parameter and use this result to establish the formula. Taylor Series in unit 6 is well presented. However, problem 6 (ii) is not better than the integral identity. The domain of the integral is not justified. An appeal to uniform convergence with respect to z is required here, but the text does not cover uniform convergence. It would have been better to postpone this problem to a later course unit.

Barry Spain

The uses of selenium

Selenium
by R. A. Zingaro and W. C. Cooper
Van Nostrand Reinhold, £25.30
ISBN 0 442 29575 8

The discovery of new elements, such as selenium, silicon and thorium represents only a small fraction of the contribution of Jöns Jakob Berzelius to chemistry. It is perhaps as well that, in naming selenium for the moon, in an association with the recently discovered tellurium for the earth, he mixed his Greek and Roman mythologies—Lunus sounds a much less attractive name for an element.

Selenium exhibits photovoltaic action, where radiation is converted directly into electricity, and photoconductivity where its electrical resistance decreases with increased illumination; it converts alternating current to direct current, and it is a p-type semiconductor. Thus photo cells, exposure meters, solar cells, rectifiers, X-rayography and electronics all use selenium, and indicate its considerable usefulness to modern science and society.

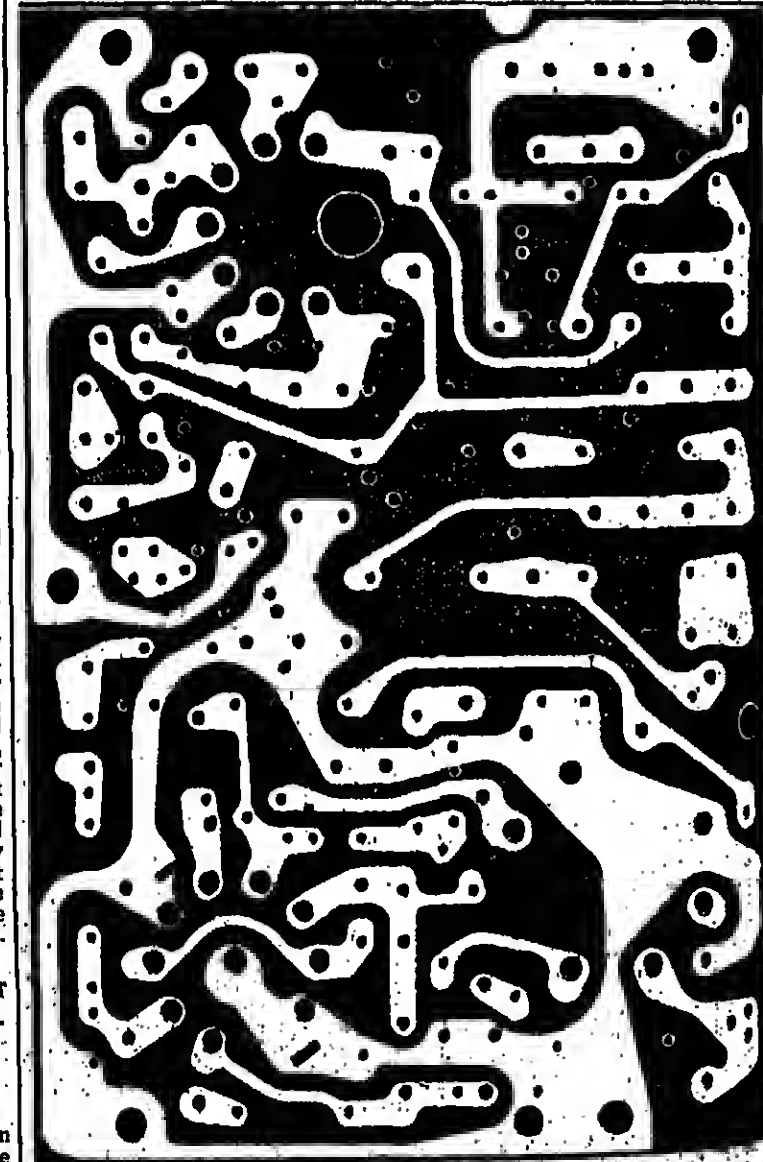
The Franz-Keldysh shift for an exponential edge is an important factor in photoelectronic properties of amorphous selenium; selenium deficiency in the diode of p-n junctions and losses in the United States of America of \$55m;

and the most brilliant red glass of the glassmaker, the selenium ruby, is coloured by the presence of a solid solution of cadmium sulphide.

The editors have gathered together a team of authors who write on these, and equally diverse aspects of selenium, with authority. Sixteen chapters written by about two dozen authors cover all that is of interest in the science and even the art of selenium, with over 2,500 literature references. It is a remarkable reference work, covering a wide range of topics which include the history, occurrence and properties of selenium, its structure and interaction with light of phonons, its optical and electrical properties, and its use in agriculture, glass, rubber and plastics and its metallurgical aspects and use. The book has a very good index and covers the entire literature of selenium up to 1970.

With a potential readership of chemists, physicists, geologists, electrical and chemical engineers, metallurgists, biochemists and toxicologists, as well as those interested in agricultural sciences and the glass, rubber, plastics, electronics and photocopying industries this volume will be a valued authority for many years ahead.

Edward Am



An example of the printing of electronic circuits by the screen process. From "Screen Printing" by J. A. Diegelmann, Evans Brothers, £5.50.

Calculus of variations

Analytical methods of optimization
by D. P. Lawden
Scottish Academic Press, £3.50
ISBN 7011-2077 0

Professor Lawden has brought his own experience to bear on the problem of presenting that rather diffuse mass of material, the classical calculus of variations, in a form which is appropriate for third-year undergraduates and postgraduate students. The emphasis is on technique and a study of the elegant and varied methods of the calculus of variations. The text has plenty of examples and each of the five parts finishes with a good selection of exercises to test understanding. It is to be recommended for undergraduate courses as a concise introduction to a subject which is not always covered.

The title emphasizes the exclusion of numerical methods. Pro

cessor Lawden is on the side of those who believe that a mathematical model that is simple enough to allow analytical solution is a good idea of the behaviour of the actual system, and the subsequent numerical solution.

The first kind of recording, we call it conversational or group discussion, in which the students are encouraged to discuss the problem, to give their own ideas, to be challenged by the teacher, and to be challenged by the students. The second kind of recording, we call it individual or personal, in which the student is encouraged to work on his own, to solve the problem, and to be challenged by the teacher, and to be challenged by the students.

C. W. Kilham

Helen Simons looks at what changes have occurred to give undergraduates a greater say in their education, eight years after the troubles of '68

Consultation or confrontation?

Self-student committees were the standard answer to student demands for a more participative framework. Two years ago, for instance, the sociology department at the University of Keele substituted workshops for the lecture-tutorial as the basic unit of learning and opened up the choice of curriculum so that students could effectively plan their degree course to match their current or developing interests.

Workshops consist of groups of six to 12 students with a tutor. Each workshop meets for a seminar period of up to two hours every week during the university year which is divided into two semesters. Each student takes two workshops of his choice each semester. The work of the group is usually focused on a problem which students play some part in defining and they each contribute in their own way to its solution both inside and outside the seminar.

Tutors act as resources for background reading, give occasional assessments, if needed, and chair the discussions. Towards the end of the semester the group prepares a statement which is shared and discussed with other students and staff at a one-day conference. Students also write individual essays which are discussed with the tutor and assessed, however, is still based on examinations. The whole idea evolved from a discussion meeting—a "sub-committee" set up to encourage open criticism of courses.

Although more students now have the opportunity to choose what they want to learn, the same flexibility is not extended to choice of learning style. The penicillin of this type of learning is that it is often over-dependent on satisfactory personal interaction. Group discussion may provide an ideal learning medium for the articulate or confident but be intimidating for the quiet or shy who find their way far more easily

through lectures, reading and the writing of essays.

But obvious though this is, few institutions can in practice offer much more than the opportunity to choose which learning style best suits them.

Arguments against providing students with a range of alternative learning approaches usually centre on the high cost in teacher time. But there are means of overcoming this problem by developing staff resources differently. For example, lecture notes and other background material for each course could be made available to students and lecturers on request; the one-to-one tutorial could be replaced by groups of three or four students in each teacher's class; this extends the range of learning styles—students may learn from each other as well as from a member of staff; group projects could be introduced as an alternative to individual projects. In some subjects students in different years could combine for seminars—extending again the range of learning opportunities. Of course, there will be all sorts of difficulties in any attempt to increase the student range of choices of learning methods. But, assuming that choice is likely to increase motivation and hence give students an opportunity to improve the quality of their learning, one could argue that the advantages outweigh the drawbacks.

The same considerations, incidentally, could also apply to university teachers. Some of them, one suspects, are equally happy with the traditional traditional lecturer's role; some, for example, will be more at ease than others in the small group teaching situation. Some members of staff

are better at personal tutoring than others and some better research advisers. So there might be a good case for rationalising an individual staff strengths.

In retrospect, it is easy to see that student representation is fundamental to the real issues of teaching and learning. For, in a sense, it is significant if it has to be related to substantive issues to which students can contribute.

The author is a member of the Nuffield Group for Research and Innovation in Higher Education.

Clive Carré writes the third article in our series 'The Active Student'.

Audiotapes: a chance to listen

The traditional role of audio-visual aids in education has been to support the lecturer in his delivery. This cautious injection into the lecture has essentially verbal content in a visual form. The process of planning your own curriculum is taken to its logical conclusion in the school of independent studies at Lancaster University and in the Nuffield Centre for the Study of Learning.

But an alternative which does not involve such radical structural changes is possible within the existing educational framework. Two years ago, for instance, the sociology department at the University of Keele substituted workshops for the lecture-tutorial as the basic unit of learning and opened up the choice of curriculum so that students could effectively plan their degree course to match their current or developing interests.

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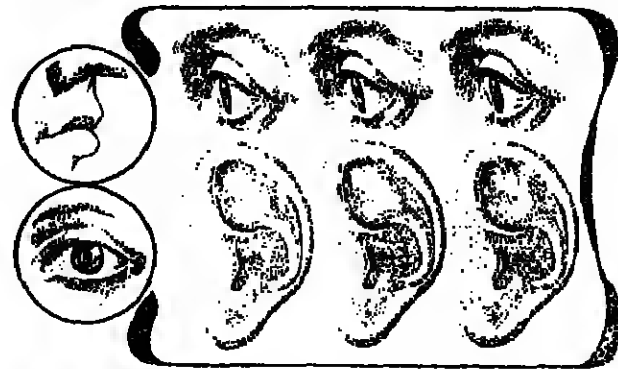
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The author is a member of the Nuffield Group for Research and Innovation in Higher Education.

With these considerations in mind we decided to concentrate principally on two activities: to publish a wide range of appropriate teaching/learning materials and to arrange meetings, conferences and schools for interested teachers. The materials, still in experimental form, are being produced in units.

A single unit is intended to provide a student with sufficient work to occupy one quarter to one third of his or her total working time over a period of four weeks. Occasionally the same unit could occupy one tenth of the student's time for 10 weeks, but this would not be

The author lectures in the school of education at the University of



SISCON: taking a broader view of teaching science

The objective of the Science in a Social Context Project (SISCON) is to promote the teaching of science at first degree level so that it takes due account of all aspects of science and its interactions with society and is not solely concerned with inculcating a purely technical expertise.

Accepting this objective, one must then ask: What do we teach? To whom do we teach? And how do we teach it? Clearly, these questions are inter-related and cannot be answered independently. In considering them it soon becomes apparent that others must be added: Who is to do the teaching? To what extent can teaching and learning be separated?

To attempt to solve such a complex connected set of problems in a single department or a single institution is difficult enough, but the project's concern is to find an approach which will be acceptable to all institutions of higher education in this country—significantly more difficult.

We recognized early that no one approach, no single teaching/learning resource would be acceptable to all users in so wide an audience and that we should therefore strive for the maximum flexibility. We also soon realised that although in some cases the sort of teaching we envisaged could be provided by specialist groups—history and philosophy of science departments, science studies units and the like—in general the teaching would have to be done by established science lecturers, if it was to have the impact we desired: to change all science degree courses. We needed to provide the means both to teach the teachers and to teach the students. Or perhaps this requirement could better be formulated to provide the means for both teachers and students to learn together.

To engage scientists in this teaching seemed to us to have an incidental and very important advantage: relative ease of communication. Discipline hova grown so far apart that, for example, the economics lecturer experiences difficulties (arising from differences in language and in approach) in getting through to, say, the physics student. Our hope is that the scientist, having first had to master the subject matter, will be able to perceive it and present it in a manner which science students will more readily understand.

Furthermore, many social problems of concern to scientists are essentially interdisciplinary: if we set up new departments to teach these topics we may be creating a new specialism and losing sight of the interdisciplinary approach which may well be essential. The ideal approach could be team teaching involving natural scientists, social scientists—what an absurd division—and "science of science" specialists working together.

With these considerations in mind we decided to concentrate principally on two activities: to publish a wide range of appropriate teaching/learning materials and to arrange meetings, conferences and schools for interested teachers. The materials, still in experimental form, are being produced in units.

A single unit is intended to provide a student with sufficient work to occupy one quarter to one third of his or her total working time over a period of four weeks. Occasionally the same unit could occupy one tenth of the student's time for 10 weeks, but this would not be

student is not sufficiently engaged, the parent department sees the subject as a minor, insignificant part of the course and such low esteem does account of all aspects of science and its interactions with society and is not solely concerned with inculcating a purely technical expertise.

Our units are not written on the pattern of a science textbook but adopt the form more usual in the arts. The units are flexible and can be augmented by lectures and tutorials. They provide sufficient material for the teacher and student to select what is appropriate for a particular course or level of study. They are also flexible in assembly; the units presently undergoing trial include such titles as "Science, Technology and the Modern Industrial State"; "Society and Food"; "Science and the Environment"; "The Sociology of Science"; "The Limits to Growth".

Fifteen units exist, a further five are being printed—all produced since the Project started in October 1973—and a further 20 will be available by the time the funds run out in September 1976. Therefore a department could take several Siscon units—on, for example, such topics as Galileo, social responsibility, scientific rationality, energy resources, the environment, materials, and to them topics on which many already have expertise within their own ranks, say on the problems of nuclear power or on atmospheric pollution and include suitable case studies; on the sitting of a nuclear power station, on concord, on cyclamates—to make a course suitable for students in the physical sciences. A quite different mix might be assembled for students in the life sciences.

The more of learning, we hope, will be implicit in the Siscon units: intensive student participation—reading, writing, discussion—supported by minimal lecturing. The teacher's role is seen as that of a guide rather than an instructor. In our view, unless students participate very actively in the teaching/learning process in this subject area, it cannot be successful. A student of the social aspects of science cannot be created in the same way as the study of thermodynamics. Some element of subjectivity is essential; the students must see themselves as involved—not necessarily the same thing as committed. One of the Siscon members is investigating the devising suitable projects in alternative technology as one way of increasing student participation.

It is too early yet to judge how successful this approach is: the first trial units were only issued last October, the latest as recently as last month. But we have had some feedback from people who have offered to try them out, including some from abroad, and from a few of the students they have tried them out on.

Even from this limited return we have learnt something: that scientists have been caught unaware by a simple and obvious fact of teaching life. To run these courses it is necessary to make material provision for them just as materials and equipment must be provided for laboratory classes. It is not reasonable to stipulate certain readings as essential for a class of such a size: they are not available in a cheap edition which each student can sensibly be expected to buy unless the department provides a sufficient number of copies; the departmental library must become the scientist's in a social context "laboratory".

Bill Williams

The author is project coordinator of the Science in a Social Context

LETTERS TO THE EDITOR

Problems of unemployed academics

from Dr Malcolm Pittock

Sir,—I think *THE* has performed a service in revealing the seriousness of the situation developing in university teaching—because of the current squeeze, a large number of posts remain deliberately unfilled after they have been vacated. This has serious implications.

Further investigation would, I think, uncover other important factors which make university teaching an insecure profession with serious difficulties peculiar to it.

My own experience suggests that there are questions which need to be asked. I am in my mid-forties, have qualifications appropriate for university teaching, eleven years experience as a member of staff in an English department in one of the older Scottish universities, and a modest amount of published work. Nearly a year ago I left my appointment for an academic reason, but for what is usually called a personal one—a divorce in which the husband (to use the appropriate Scottish legal term) was a member of the same department as myself.

The reason is easily understood and not irrelevant to the theme of this letter: the marriage was just under seven years old, and the cause of the virtual impossibility of a middle-aged married couple's both obtaining employment in a department other than that in which they were established.

I am now unemployed and living on benefits, which I supplement by realizing the surrender value of certain of my FSSU policies. I have applied for a number of suitable university posts but have not been shortlisted. Beginning to wonder if at 45 I have any prospect of returning to university teaching at all, especially since I have discovered that I am not in the running for temporary or junior posts, such as those of tutorial assistant.

This leads me to suggest that it might be fruitful to pursue the following lines of inquiry:

(1) In the present squeeze has the increasing competition for a diminishing number of university posts led to such a dramatic increase in the standard required that the quality of entrants is higher than it has ever been?

My experience would suggest that it is, particularly since, if other things were equal, it would be reasonable to suppose that academics would normally be generous enough to a fellow academic in

Once upon a time . . .

from Mr J. L. Wood

Sir,—Professor Merrett's views (*THE*, July 25) reminded me of an old Norwegian fable. There was once a king who enjoyed ruling very prosperously. The prosperity was in no small measure due to a special breed of geese, reared on the royal farms, which had the unusual facility of laying golden eggs.

The king, however, did not take this happy state of affairs for granted. Being a progressive monarch, he called in an Eminent Visiting Economist to make a rostrated analysis of the royal farms. The economist found that the cost of breeding and rearing the geese was considerable.

He also found that the geese received no wages, and paid no taxes. The Eminent Visiting Economist, with his characteristic candour, told the king that the geese were extremely unprofitable, and recommended their extinction.

As it came to pass that all the geese—or nearly all the geese—were killed. Now after a short while it became apparent that instead of the expected benefits a great decline in prosperity occurred.

As the king was sore perplexed, he again sought advice. This time he did not choose an economist. Instead he chose a peasant, renowned for having both common sense and a PhD.

"Sir," the peasant said, "the error made by the EVE was exceedingly simple. He measured the value of the geese by the amount they took out of the common wealth, which was little and not by the amount which they put in, which was great."

The king immediately saw the simple truth of this answer, and asked the peasant what reward he wished.

"Sir," replied the peasant, "a few of your Majesty's geese found refuge with me. May I be forgiven for preserving them, and keep two of them." The king graciously granted both requests.

The king's thoughts then turned to the Eminent Visiting Economist, whom he summoned to his presence. The king then asked the EVE a short and simple question: "When he heard the question the EVE grew smaller and smaller, until soon he vanished from sight. Nor did he ever return again."

Sincerely,
J. L. WOOD,
Great Bookham, Surrey.

The Ontario formula

from Mr R. J. Baker

Sir,—You printed a story by Alan Cane to the effect that the University Grants Committee in Britain may be using either the Ontario formula or something like the Ontario formula for distributing resources in Britain (*THE*, July 11).

The story claims that the Ontario formula distributes grants according to "the student load in the major subject areas in each university." Far more significant than the subject is the level—that is: first year, senior, undergraduate, master's, doctorate, honours, major, etc.

According to the story, Dr W. R. Cook and Dr J. E. Dunworth offer three explanations for the results of their research. I suggest a fourth, which I believe to be closer to the truth, namely, that the Ontario "formula" is largely a rationalization of costs which had earlier been derived from academic practice in Canada, itself derived from relatively common practice in the English-speaking world.

If my proposition is true, it is not in the least surprising that the distribution in British universities of the Ontario formula should be so uneven. Why, for example, is it more expensive to teach science students than arts students? There may be very good reasons, but I do not think that those reasons are the basis of the weighting in most places. The province of Ontario, the formula later.

V. W. Bladen, who led the way to do with the use of local financing in Canada, argued that the formula was a rationalization of the real costs of the different disciplines and levels of instruction were consistent with the formula. I decided that the necessities of teaching at the different levels justified the formula.

Yours sincerely,
R. J. BAKER,
President, University of Prince Edward Island, Canada.

Management exercises

from Mr John Riley

Sir,—I am amazed at the criticism levelled by Dr J. Howard at the management exercises used by the Harrow College of Technology and Art in their selection procedure for a head of engineering (*THE*, July 11).

He is quoted as complaining about the waste of money involved in "subjecting a large number of highly qualified, experienced professionals to this kind of exercise," and he apparently thinks that a normal interview combined with an extensive use of references would give comparable results.

As the post for which he was a candidate was that of head of engineering, one might assume that the knowledge and skills which most of the applicants possessed were in engineering. The post of head of any department requires management and administrative skills which would not normally, and certainly not necessarily, be acquired from the study of subjects other than management.

The principal at Harrow, Mr H. Anscombe, points out that the poten-

tial cost of employing a head of department is high. This is surely justified by a selection procedure which attempts to assess the aptitude of candidates for the aspects of the hands work to which their qualifications do not relate.

Moreover, it is doubtful whether references can be an adequate substitute because of the standardized nature of the references, and on account of the subjectivity of these statements. References have the further drawback that they judge a man on past performance, during which may not have been afforded an opportunity for displaying his present ability.

I personally applied the technique taken by Mr Anscombe and colleagues in having the candidate to complete a written exercise, which was a selection procedure which has some basis, even though it may be fallacious, and may require refinement.

Yours faithfully,
JOHN RILEY,
263 Dimevale Parade West,
Newcastle, Staffordshire.

Open University programmes August 30 to September 5

Saturday August 30	
8.00	Psychology of cells and organisms: Physiological adaptation II (5231).
8.05	Art foundation course: The shape of the world (5232).
8.10	Mathematics foundation course: Vectors (5233).
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The future of the colleges

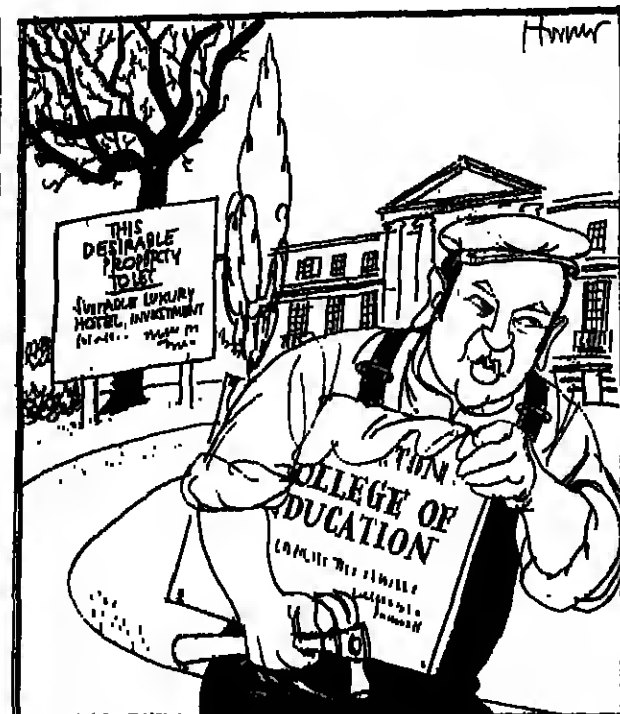
Student targets for 1981 set by the DES

NORTH		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Bode; St Hild's	500	Agreed
Charlotte Mason	300	Agreed
Neville's Cross	500	Agreed
Sunderland Polytechnic (Sunderland College of Education and Polytechnic Education Department)	500	Agreed
Alnwick	—	Initial training to be discontinued
Darlington	—	Initial training to be discontinued
St Mary's Farnham	800	Near agreement
Newcastle Polytechnic (City of Newcastle and Northern Counties)	850	Under consideration
Northumbria	750	Under consideration
Teeside Polytechnic (Middlesbrough and Teesside Day)	400	Under consideration

YORKS/HUMBERSIDE		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Bretton Hall	350	Agreed
Doncaster; Scawby	300	Agreed
Huddersfield Polytechnic	300	Agreed
Education Department	800	Agreed
Hull; Endsleigh	425	Agreed
Leds Polytechnic (City of Leeds, Amos Graham and Polytechnic Education Department)	1,000	Agreed
Margaret McMillan; Bingley; Ilkley	1,000	Agreed
North Riding	850	Agreed
Sheffield Polytechnic (City of Sheffield and Tinsley; Thornbridge)	1,000	Agreed
St John's York; Ripon	800	Agreed
Trinity; All Saints	750	Initial training to be discontinued
Warrington Castle	—	Initial training to be discontinued

NORTH-WEST		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
C. F. Mott; Ethel	750	Agreed
Wormold	600	Agreed
Chester	600	Agreed
Croze; Alsager	1,100	Agreed
Edge Hill	800	Agreed
Liverpool Polytechnic (I. M. Marsh)	300	Agreed
Manchester Polytechnic (Didsbury and Polytechnic Education Department)	300	Agreed
Manchester Day; Mother; Elizabeth	1,850	Agreed
Oakfield	575	Agreed
Preston Polytechnic (Chorley and Poulton)	550	Agreed
St Martin's	550	Agreed
Christ's; Notre Dame	1,250	Near agreement
St Katharine's	850	Near agreement
De La Salle; Sedgely	300	Under consideration
Park	—	Under consideration
F. L. Calder	—	Under consideration

WEST MIDLANDS		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Birmingham Polytechnic (Aston, City of Birmingham and Bordesley)	1,000	Agreed
Coventry (Warwick University)	700	Agreed
Madley	850	Agreed
Newman	700	Agreed
West Midlands	600	Agreed
Worcester	650	Agreed
Redbrook	—	Initial training to be discontinued
St Paul's Rugby	—	Initial training to be discontinued



SIGNS OF THE TIMES

EAST MIDLANDS		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Shearston	450	Under consideration
Hereford	—	Initial training to be discontinued
St Peter's Saltley Wolverhampton Polytechnic (Wolverhampton Day and Dudley)	700	Under consideration

EAST ANGLIA		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Bishop Grosseteste Lincoln	400	Agreed
Bishop Lonsdale Derby	450	Agreed
Easton Hall	500	Agreed
Loughborough (Loughborough University)	600	Agreed
Northampton	500	Agreed
Trent Polytechnic (Clifton and Polytechnic Education Department)	950	Agreed
Matlock	500	Agreed
Kesteven	—	Initial training to be discontinued
(Peterborough Outpost)	135	Under consideration
Mary Ward	—	Initial training to be discontinued
Leicester Polytechnic (Leicester)	500	Under consideration

GREATER LONDON		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Keswick Hill Homerton	700	Agreed
—	650	Near agreement

SOUTH WEST		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
St Mark and St John (including Camborne Outpost)	580	Agreed
Bath; Newton Park; Bristol Polytechnic (Redland and St. Mathias)	1,400	Agreed
Rolle	600	Agreed
Weymouth	500	Agreed
St Luke's Exeter (Exeter University)	500	Near agreement
St Paul's Cheltenham; St. Mary's Cheltenham; Gloucestershire; Sarum St Michael (See Other South East Region)	1,000	Near agreement

WALES		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
—	—	—

OTHER SOUTH EAST		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
Bodford; Bedford PE	800	Agreed
Berkshire	700	Agreed
Brighton Polytechnic (Brighton)	600	Agreed
Christ Church Canterbury	630	Agreed
Eastbourne; Chelsea PE	800	Agreed
Saferd	430	Agreed
Newland Park Nonington	500	Agreed
Oxford Polytechnic (Lady Spencer Churchill)	400	Agreed
Portsmouth Polytechnic (Portsmouth)	500	Agreed
Shoreditch	700	Agreed
Wall Hall, Balls Park	700	Agreed
Putteridge Bury	—	Initial training to be discontinued
Saffron Walden	—	Initial training to be discontinued
Sittingbourne	—	Initial training to be discontinued
Brentwood	450	Near agreement
King Alfred's Winchester; Sarum St Michael	900	Near agreement
La Sainte Union	600	Near agreement
Milton Keynes	400	Near agreement
Bishop Otter; Bognor	750	Under consideration
Culham	—	Under consideration
Hockerill	—	Under consideration
St Osyth's	300	Under consideration
Westminster	450	Under consideration

SOUTH WEST		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
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SOUTH WEST		
1981 Provisional Target of Teacher Training Places	State of negotiations about future	
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Classified Advertisements

Index to Appointments Vacant, Wanted and other classifications

Appointments vacant

Universities
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Technical Colleges
Colleges and Institutes of Technology
Colleges of Education
Colleges of Further Education

Colleges and Departments

of Art
Administration
Overseas
Government
Industry
Adult Education
Librarians
General Vacancies

Appointments wanted

Other classifications
Announcements
Exhibitions
For Sale and Wanted
Courses
Holidays and Accommodation
Typing and Duplicating

Universities

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THE NATIONAL INSTITUTE FOR HIGHER EDUCATION LIMERICK

LECTURER/ASSISTANT LECTURER IN COMMUNICATIONS
Person appointed will be primarily involved in the development and implementation of modules in written and oral communication. Relevant teaching and/or practical experience is required. Proficiency in the use of graphics and other visual aids in communication would be of advantage.
A primary honours degree or equivalent professional qualification is a basic requirement.

LECTURER IN ORGANISATION AND METHODS
To participate in the development of the Administrative Systems programme particularly in the area of management services.
To design, develop and teach courses in the theory and practice of Organization and Methods.
Applicants should have several years' experience in a management services function.
The minimum academic qualification is an honours degree.
SALARY: Lecturer, £4,722-£5,138
Assistant Lecturer, £3,542-£4,138
Additional annual allowances of £100 marriage and £70 per child together with other benefits.
Application material available from Personnel Office, National Institute for Higher Education, Limerick, should be completed and returned by Friday, 26th September, 1975.

THE OPEN UNIVERSITY POST-EXPERIENCE COURSES UNIT

COURSE ASSISTANT
Applications are invited for the post of Course Assistant in the Post-Experience Courses Unit. The work will include assisting in the maintenance of the Post-Experience Courses Unit, the development of new courses, and the production of course materials. The successful candidate will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
The appointment is for three years and further extension is available. Particulars of the post and application forms are available from the Unit, The Open University, Milton Keynes MK9 3QJ. Closing date: 10.10.75.

ULSTER: THE NEW UNIVERSITY EDUCATION CENTRE

LECTURER IN EDUCATION
Applicants should have advanced qualifications in education or a related discipline, a specialist interest in primary education, and a research interest in some aspect of child study and/or the design of learning systems. School teaching experience is desirable.
Salary scale (excluding pension) (with P80/AUS) £2,110-£4,695 per annum (under review).
Preference will be given to an appointment at the lowest end of the scale.
Further particulars may be obtained from The Registrar, The New University of Ulster, Coleraine, Northern Ireland (quoting Ref: 75/04/82), to whom applications should be sent, together with a recent photograph and a list of references, should be returned not later than 20th September, 1975.

THE QUEEN'S UNIVERSITY OF BIRMINGHAM

CHAIR OF AERONAUTICAL ENGINEERING
Applications are invited for the Chair of Aeronautical Engineering. The successful candidate will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
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THE UNIVERSITY COLLEGE OF WALES

ABERYSTWYTH
Applications are invited for the post of Director of Extra-Mural Studies to commence in April, 1976. Salary within P80/AUS scale.
Further particulars available from the Registrar, to whom applications should be sent, together with a recent photograph and a list of references, should be returned not later than 20th September, 1975.

THE OPEN UNIVERSITY FACULTY OF ARTS ARTS STAFF TUTOR POSTS

Art, Ornamental or Specialist in Art, History, History of Art, History of Science, Music or Philosophy. Applications are invited for seven tutor posts of Staff Tutor in Arts, one attached to each of the following regional offices:
South West: Bristol, West Midlands: Birmingham, East Midlands: Nottingham, Yorkshire: Leeds, North: Newcastle-upon-Tyne, Scotland: Edinburgh, South East: East of London.
Candidates should have good academic qualifications in one or other of the disciplines of Art, History and Architecture, Classical Studies, History, History of Science, Music or Philosophy.
Well-qualified Arts graduates will also be welcome to apply. Salary within scale £2,110-£4,695 per annum (under review), plus telephone, pension and membership of the University's Superannuation Scheme.
Further particulars and application forms are available from The Personnel Manager (ASTP) The Open University, Milton Keynes MK9 3QJ. Closing date: 10th September, 1975.

AUSTRALIA LA TROBE UNIVERSITY

LECTURER/ASSISTANT LECTURER IN MICROBIOLOGY
Two positions.
Preference will be given to candidates with research experience in microbiology and a research interest in any field of microbiology.
The Department of Microbiology is a new department in the Faculty of Science, La Trobe University, Victoria, Australia. The department is currently seeking a Lecturer in Microbiology and an Assistant Lecturer in Microbiology. The successful candidates will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
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THE OPEN UNIVERSITY POST-EXPERIENCE COURSES UNIT

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AUSTRALIA THE AUSTRALIAN NATIONAL UNIVERSITY

UNIVERSITY LIBRARY ASSOCIATE LIBRARIAN
Applications are invited for the position of Associate Librarian in the University Library. The successful applicant will be responsible for the management of the library's collection of books, journals, and other materials. The successful candidate will be required to undertake a variety of tasks.
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AUSTRALIA MONASH UNIVERSITY

DEPARTMENT OF ADMINISTRATIVE STUDIES LECTURERS—TWO POSITIONS
For teaching mainly at the undergraduate level and for supervising research. The successful candidates will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
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AUSTRALIA AUSTRALIAN NATIONAL UNIVERSITY

RESEARCH SCHOOL OF PHYSICAL SCIENCES RESEARCH FELLOW/ SENIOR RESEARCH FELLOW
Applications are invited for the position of Research Fellow in the Research School of Physical Sciences. The successful candidate will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
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BATH THE UNIVERSITY

LIBRARY ASSISTANT LIBRARIAN/ INFORMATION OFFICER
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LONDON ROYAL POSTGRADUATE MEDICAL INSTITUTE

ADMINISTRATIVE ASSISTANT
Applications are invited for the position of Administrative Assistant in the Royal Postgraduate Medical Institute. The successful candidate will be required to undertake a variety of tasks.
Applicants should have a minimum of three years' experience in the design of learning materials and adult education. Salary will be on the Course Assistant scale from £1,650 to £2,150 (under review) plus telephone, pension and superannuation.
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37-28,913); including the names of the applicants, should be submitted by 6 October 1993 to the Director, Oxford Polytechnic, PO Box 133, Oxford OX3 0BP, from whom further part 1 application forms may be obtained.

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